Draft

2005 – 2007 Implementation Plan

for the

Updated Proposed Action

U.S. Army Corps of Engineers
Bureau of Reclamation
Bonneville Power Administration

March 2, 2005

Table of Contents

I. Introduction

The Federal Columbia River Power System (FCRPS), a system of dams and reservoirs located in the Columbia River Basin, is operated and maintained by the Corps of Engineers (Corps) and Bureau of Reclamation (Reclamation). The FCRPS projects were authorized by Congress for multiple purposes, including flood control, irrigation, fish and wildlife, power generation, navigation, water quality, municipal and industrial water, and recreation. Bonneville Power Administration (BPA) is responsible for marketing and transmission of power generated from these projects. Collectively, the Corps, Reclamation, and BPA are referred to as the Action Agencies. This Draft Implementation Plan (*Draft IP*) describes planned actions and expected outcomes to avoid jeopardy to Columbia Basin salmonids listed or proposed for listing under the ESA (13 species of salmon and steelhead) and adverse modification of designated critical habitat. The *Draft IP* covers a three-year period, 2005-2007.

ESA-listed ESUs included in the 2004 BiOp

1. Snake River spring/summer Chinook salmon
2. Snake River fall Chinook salmon
3. Upper Columbia River spring Chinook salmon
4. Upper Willamette River Chinook salmon
5. Lower Columbia River Chinook Salmon
6. Snake River steelhead
7. Upper Columbia River steelhead
8. Mid-Columbia River steelhead
9. Upper Willamette River steelhead
10. Lower Columbia River steelhead
11. Columbia River chum salmon
12. Snake River sockeye
13. Lower Columbia River coho *(proposed)*

This *Draft IP* is based on the Action Agencies' *Final Updated Proposed Action for the FCRPS Biological Opinion Remand* (UPA), which provides the broader context for what the Action Agencies expect to accomplish over a longer time period. The Action Agencies formulated the UPA for NOAA Fisheries' consideration as it drafted the *Revised 2004 Biological Opinion on the Operation of the Federal Columbia River Power System and 19 Bureau of Reclamation Projects* (2004 BiOp). The UPA describes the actions and performance goals that the Action Agencies commit to achieve over the duration of the 2004 BiOp (through 2014). Under the UPA, the Action Agencies made specific commitments to actions going beyond those contained in the previous Biological Opinion for operation of the FCRPS (the 2000 BiOp) including accelerated installation of surface passage facilities such as spillway weirs and other improvements; expanded management of predatory fish and birds, habitat actions with specific locations and performance metrics, and new hatchery program initiatives. NOAA Fisheries concluded that these collective actions would avoid jeopardy to 13 evolutionarily significant units (ESUs) of Columbia Basin salmonids listed or proposed to be listed under the ESA and the destruction or adverse modification of designated critical habitat. In January 2005, each Action Agency documented its intent to implement the actions in the UPA and analyzed in the 2004 BiOp in decision documents posted on www.salmonrecovery.gov.

The UPA and the *Draft IP* are both based on an adaptive management framework of performance standards and measures, implementation strategies and planning, progress reporting and assessment at regular intervals, and a comprehensive research, monitoring, and evaluation (RM&E) program. This *Draft IP* is part of the adaptive management framework, and describes the Action Agencies' work plan for achieving the UPA's 2007 performance goals.

The 2004 BiOp included (1) an ***Incidental Take Statement*** (ITS) with reasonable and prudent measures and terms and conditions to authorize incidental take associated with the implementation of actions in the UPA; and (2) ***Conservation Recommendations*** to avoid or minimize adverse effects from the implementation of actions in the UPA. The Action Agencies address implementation of the ITS and Conservation Recommendations in this *Draft IP*.

A. Public Review and Comment

This *Draft IP* describes in greater detail the actions that the Action Agencies are implementing to avoid jeopardy and improve survival of listed salmon and steelhead during the 2005-2007 time period. The *Draft IP* incorporates many of the comments that were previously submitted on the draft 2004 BiOp and UPA. For example, the *Draft IP* includes tributary habitat conservation measures in the Okanogan subbasin in response to comments suggesting that the measures benefit Upper Columbia River steelhead.

The Action Agencies will continually seek input and involvement from existing forums and processes throughout implementation of the UPA so that actions implemented to meet BiOp and UPA goals take into account regional interests to the greatest extent possible.

The IP reflects a performance-based approach and over time the Action Agencies will be adapting actions to best meet our performance objectives. Regional input on how best to achieve these performance targets is important. Implementation plans will be prepared for a 3-year period. We intend to hold regional discussions as we evaluate the results of our progress (through Progress Reports) and determine whether mid-course modifications need to be made to our implementation actions in order to achieve our three-year performance targets. We will report annually on our implementation progress as well as on a comprehensive basis at 3-year intervals.

II. Summary of Actions by ESU

Our UPA included specific commitments for ESUs affected by FCRPS operations. Over the next 3 years we will implement the following types of actions to improve the survival of listed ESUs:

Hydrosystem actions: Hydrosystem actions are expected to improve survival to all listed ESUs. Dam passage improvements, water management, and fish transportation are expected to provide survival improvements and to inform future actions.

- The Corps will continue to configure dam facilities to improve juvenile and adult fish passage survival.
- We will continue to operate projects to provide flows and spill operations to improve fish survival.
- The Corps will continue to operate and maintain fish passage facilities to improve reliability and fish survival.
- We will implement an RM&E program that evaluates the effectiveness of configuration improvements and demonstrates the system improvements.

Predator control actions: Predator control actions are expected to provide survival improvements to all listed ESUs.

- The Corps and U. S. Fish and Wildlife Service (USFWS) are finalizing the Caspian Tern Environmental Impact Statement (EIS). The Corps, BPA, and USFWS and will initiate implementation of the selected alternative.
- We are continuing and expanding our research efforts to monitor and evaluate the effects of Caspian tern redistribution on juvenile salmon.
- We will also initiate studies to investigate the regional double-crested cormorant population and potential management measure to disperse that population.
- BPA is increasing the reward structure for the Northern Pikeminnow Management Program to achieve further reduction of pikeminnow predation on listed salmon and will also use an

incentive-based approach to test site-specific removals of northern pikeminnow and other non-indigenous fish predators.

Hatchery actions: In addition to our conventional hatchery mitigation program, certain hatchery actions will reduce the risk of extinction to many ESUs and will provide survival benefits to Snake River fall Chinook and Snake River sockeye.

- BPA will continue to fund safety-net programs for the Snake River Sockeye, Snake River spring/summer Chinook, Mid-Columbia steelhead, Lower Columbia River steelhead, and Columbia River chum ESUs as long as NOAA Fisheries considers these programs to effectively contribute to reducing the risk of extinction.
- The Corps and BPA will improve the adult trap at Lower Granite Dam to benefit the Snake River fall Chinook ESU.
- BPA will enhance Snake River sockeye smolt production in conjunction with the current safety-net program to benefit the Snake River sockeye ESU.
- BPA will continue to fund the Safety Net Artificial Propagation Program (SNAPP) planning process and if necessary will develop safety-net contingency plans for populations identified as being at high risk of extinction.

Estuary habitat improvements: Estuary habitat improvements are expected to benefit all listed-ESUs, but are primarily focused on improving survival of Snake River fall Chinook.

- The Corps and BPA will protect, enhance, and restore shallow water and wetland habitats along and adjacent to the mainstem Columbia River below Bonneville Dam and tidal wetlands.

Tributary habitat improvements: Tributary habitat improvements are expected to improve habitat and the survival of Upper Columbia River, Snake River, and Mid-Columbia River ESUs.

- Reclamation and/or BPA will lease, purchase, and/or conserve 12 cubic feet per second (cfs) of streamflow; resolve 5 irrigation diversion screen problems; restore 60 miles of tributary access and 4 miles of stream complexity; and protect or enhance 6 miles of riparian habitat for the Upper Columbia River spring Chinook and steelhead ESUs in the Wenatchee, Entiat, and Methow subbasins.
- As conservation measures to improve tributary habitat:
    - BPA will improve fish habitat and implement riparian easements for Upper Columbia River steelhead in the Okanogan subbasin.
    - Reclamation will lease, purchase, and/or conserve 20 cfs of streamflow and also provide technical assistance to resolve 10 irrigation diversion screen problems and to restore 54 miles of tributary access and 0.3 miles of complexity for the Snake River spring/summer Chinook and steelhead ESUs in the Lemhi Upper Salmon and Little Salmon subbasins.
- Reclamation will participate in projects to lease, purchase, and/or conserve 7 cfs of water and also will provide technical assistance to resolve 30 irrigation diversion screen problems; restore 24 miles of tributary access; and restore 3 miles of complexity for the Mid-Columbia River steelhead ESU in the Upper John Day, Middle Fork John Day, and North Fork John Day subbasins.

Research, monitoring and evaluation (RM&E): The Action Agencies are continuing to implement a comprehensive RM&E program.

- We will continue to monitor the status of ESA-listed fish populations.
- The effects of hydrosystem and non-hydrosystem actions on fish production, survival, fish condition and habitat condition will be assessed in a quantitatively rigorous approach.
- We will strive to resolve areas of uncertainty in biological assessments of the survival conditions and the needed survival improvements for ESA-listed fish populations.

- Projects supporting the RM&E program are being implemented in the hydrosystem corridor and estuary and tributary habitat areas. Action effectiveness monitoring and evaluation of the predator control and safety-net hatchery programs are also being implemented and will continue as an important component of the Action Agencies' efforts.
- Regional coordination remains a critical aspect of the Action Agencies RM&E Program and we are continuing our participation with Pacific Northwest Aquatic Monitoring Program (PNAMP), Northwest Environmental Data-Network (NED), Lower Columbia River Estuary Partnership (LCREP), Independent Scientific Review Panel (ISRP), the Northwest Power and Conservation Council (Council), NOAA Fisheries' Regional Forum, Anadromous Fish Enhancement Program (AFEP), and other existing forums engaged in RM&E issues.

III. General Approach

A. Adaptive Management

In the UPA, the Action Agencies prioritized actions for the ESUs most in need of survival improvements. This general prioritization and "stacking" of actions is conceptually displayed in **Table 1**. Our RM&E program will verify if we have prioritized these actions correctly.

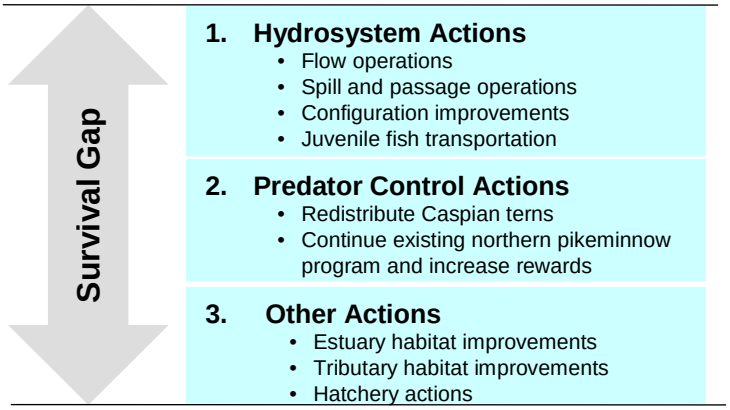

Table 1 Action Agency general prioritization of actions to fill FCRPS survival gaps

B. Performance Measures and Progress Reporting

The overarching performance standard for the operation of the FCRPS is juvenile and adult survival through the hydrosystem. The Action Agencies have largely achieved or exceeded the adult performance standards in the 2000 FCRPS BiOp and will continue to monitor adult passage and periodically assess survival to ensure that adult survival remains high.

Each non-hydrosystem action in the UPA also contains performance measures to ensure accountability for performance and ultimately allow for evaluation of biological performance. The Action Agencies will monitor performance and report the results in annual progress reports and in comprehensive performance evaluations for 2007 and 2010.

Annual Progress Reports

Performance measures will be tracked annually to help determine priorities for management actions and to adaptively manage restoration efforts for affected ESUs. For the term of the UPA and BiOp, our *annual progress reports* will address:

Overall Adult Trends

- Report adult abundance and trends for each listed ESU to determine priorities and timing of future actions to improve juvenile fish survival.

Adult and Juvenile Fish Survival Through the Hydrosystem

- Report on adult and juvenile system survival based on the best available information. We may use surrogates as indicators for some ESUs.
- Assess adult survival through the hydrosystem to ensure that adult passage survival remains high.
- Measure total system juvenile survival for ESUs that have a combined management strategy of both transportation and in-river migration.
- Measure in-river survival where transportation is not available or effective as a management tool.

Predation Rates

- Report on the change in annual predation rates and the estimated resulting change in annual juvenile salmonid survival rates.

Habitat Measures

- Report the numbers of acres protected, restored, or enhanced in the estuary from Action Agency sponsored programs.
- Report the cubic feet per second of water leased or purchased and/or conserved, the number of irrigation diversion screen problems resolved, the miles of tributary access or complexity restored, and the miles of riparian habitat protected or enhanced in the Wenatchee, Entiat, and Methow subbasins from Action Agency-sponsored programs.
- Report on our progress implementing conservation measures and actions.

Hatchery Measures

- Report on the continued operation of the existing safety-net programs included in the UPA.

- Report progress on the construction at Oxbow Hatchery for the expanded production of an additional 150,000 Snake River sockeye salmon smolts to begin in 2008 (if approved through *US v. Oregon*).
- Beginning in 2008, if approved through *US v. Oregon* and adequate broodstock is available, report on the production of an additional 150,000 Snake River sockeye salmon smolts.
- If the management actions are approved through *US v. Oregon*, we will report on the expansion and operation of the Lower Granite Dam adult fish trap to increase Snake River fall Chinook broodstock collection, support removal of out-of-basin fall Chinook strays, conduct research, and improve accuracy of monitoring of the ESU status.

Comprehensive Performance Evaluations:

Our ***comprehensive evaluation reports*** will:

- Identify system juvenile survival rates that were achieved for each year of UPA implementation based on empirically estimated in-river survival rates that are available, coupled with updated model analyses that include transport survival. Compare these estimates of juvenile survival rates to a performance standard represented by the mean and range of system survival estimates from the 2004 BiOp assessment for a subset of comparable water years.

- Determine whether the empirically derived adult survival rates are continuing to equal or exceed the expected adult survival rates for the applicable subset of water years.

- Provide a comprehensive summary of the performance measures for non-hydro actions and compare them to the performance anticipated under the 2004 BiOp assessment.

IV. Actions to be Implemented by Category

This section includes project level detail for specific actions to be implemented by the Action Agencies during the 2005 to 2007 timeframe. The section is organized by category of action (hydrosystem, predator control, habitat, hatchery), applicable strategy/substrategy, and targeted ESU. Near- and long-term priorities are identified by strategy or substrategy as appropriate. The priorities describe the performance measures to be achieved in the near-term (by 2007) and the long-term (by 2010 or in some cases of hydrosystem configuration improvements 2014). The project level detail includes steps or actions that the Action Agencies are taking to achieve those priorities.

A. Hydrosystem Actions

ESUs benefited: The hydrosystem actions have varying benefits to all or most of the listed ESUs in the Columbia River Basin.

Table 2 summarizes the specific ESUs benefited by the following groups of hydrosystem actions. These actions are associated with the three hydrosystem strategies (see below).

Table 2 ESUs Benefited by Hydrosystem Actions

	LOWER COLUMBIA CONFIGURATION IMPROVEMENTS	LOWER SNAKE CONFIGURATION IMPROVEMENTS	FLOW OPERATIONS	LOWER COLUMBIA SPILL & PASSAGE	LOWER SNAKE SPILL & PASSAGE	JUVENILE FISH TRANSPORTATION
Upper Columbia Spring Chinook	x		x	x		x
Upper Columbia Steelhead	x		x	x		x
Snake River Spring/Summer Chinook	x	x	x	x	x	x
Snake River Steelhead	x	x	x	x	x	x

Snake River Sockeye	x	x	x	x	x	x
Snake River Fall Chinook	x	x	x	x	x	x
Mid-Columbia Steelhead	x		x	x		x
Lower Columbia Chinook	x		x	x		
Lower Columbia Steelhead	x		x	x		
Columbia River Chum	x		x	x		
Upper Willamette Chinook			x			
Upper Willamette Steelhead			x			
Lower Columbia Coho	x		x	x		

Configure Dam Facilities to Improve Juvenile and Adult Fish Passage Survival

Near-term priority (2007): Considerable effort has been undertaken in the last decade to improve and track juvenile and adult passage survival through the hydrosystem. Safe and efficient passage through the hydrosystem is essential to sustaining the long-term viability of the various species and stocks in the Columbia Basin. Information from these programs has been important in providing direction for future improvements in the hydrosystem.

Through 2007 the Corps will focus on actions that were initiated in the 2000 FCRPS BiOp and are continuing based on the need to improve passage survival rates at mainstem projects. Action Plans are underway to guide specific actions at each of the Lower Snake and Columbia River projects and to determine the optimal combination of adult and juvenile passage actions to meet the system performance standards. Alternatives include surface collection techniques (removable spillway weir (RSW)/corner collector), screened bypass improvements, turbine operation improvements, and sluiceway passage improvements. As each dam is unique and poses different juvenile passage challenges, each project will be assessed for measures that will improve performance.

Long-term priority (2010): It is anticipated that many of the dam specific configuration actions will be initiated by 2010 and complete by 2014 depending on availability of funds. However, in 2014, some of the final post-construction studies to refine operations of the configuration improvements may still be occurring.

Mainstem Adult and Juvenile Passage Improvements

The Action Agencies will implement the project specific configuration modifications shown in Table 3 to improve adult and juvenile passage survival through the FCRPS hydrosystem.

Table 3 Configuration Modifications

Project/Action	Objective/Deliverable	Planning Date[1]
Bonneville Dam		
Bonneville 2nd Powerhouse fish guidance efficiency (FGE) improvements – The Corps will improve passage and survival of spring and summer juvenile fish through	Complete the Action Plan for Bonneville 2nd powerhouse FGE program.	2005

[1] Schedules and actual construction of these features will be dependent on results of on-going research, regional collaboration and prioritization, and future appropriations. While the order of construction and final configuration may vary, surface bypass improvements are expected to be in place at the eight lower mainstem dams in the next ten years.

Project/Action	Objective/Deliverable	Planning Date[1]
Bonneville Dam.	If warranted, initiate design and construction of juvenile improvements. Anticipate two units will be modified per year.	2006-2008
Bonneville 1st Powerhouse sluiceway improvements – Results from 2004 suggested very high survival through the Bonneville 1st powerhouse sluiceway.	Conduct second year of testing.	2005
	Pending results of 2005 testing, initiate designs to improve sluiceway efficiency.	2006
Bonneville 2nd Powerhouse trashrake – This will provide for improved debris cleaning to improve safety for fish passing the bypass system.	A new trashrake will be fabricated and delivered to the Bonneville 2nd powerhouse.	2005
Bonneville decision document – This document will assist in determining if additional actions are needed at Bonneville Dam.	Update the Bonneville Project decision document following 2005 project survival tests.	2006
Adult Passive Integrated Transponder (PIT) improvements – This will increase the capability to monitor adult PIT-tag returns and improve ability to evaluate behavior of adults in the ladders.	Install additional adult PIT systems in the Washington shore ladder.	2005
	Modify Bradford Island ladder.	2006
Bonneville 2nd Powerhouse corner collector PIT-tag detection system – This system will allow for improved reach survival estimates for yearling Chinook, steelhead, and fall Chinook.	Install a detection system in the Bonneville 2nd powerhouse corner collector flume.	Current schedule 2006
	Perform post-construction evaluation, and if warranted, install additional antenna array.	2007-2008
Full flow bypass PIT detection – Full flow bypass PIT detection at Bonneville Dam 2nd powerhouse will assist in reducing stress while still providing PIT detection when in full bypass mode. Currently fish PIT detection requires fish to go through a dewatering facility down to approximately 1 cfs for sampling. The purpose of the project is to provide PIT-tag detection on the full flow 30/36 cfs bypass flume.	Implement full bypass mode when collection and handling at the monitoring facility is not needed.	Not scheduled at this time. Will be discussed in the Regional Forum.
The Dalles Dam		
Action Plan framework document – An Action Plan for fish passage improvements to improve juvenile survival. Following completion of the decision framework document, the alternatives and/or schedule in the configuration actions listed below may be modified.	Complete Action Plan framework document, alternatives being considered in the document include additional spillway improvements, RSW, behavioral guidance system (BGS) to the spillway, BGS to the sluiceway, sluiceway entrance improvements, sluiceway outfall relocation, surface flow bypass at the powerhouse, juvenile bypass system (JBS), turbine improvements, and back-up auxiliary water supply (AWS) systems at the north and east adult fishways.	May 2005

Project/Action	Objective/Deliverable	Planning Date[1]
Sluiceway improvements – Hydroacoustic results from 2004 suggest improved fish survival by opening sluiceway entrances above two turbine units rather than one.	Conduct a second year evaluation to refine sluice gate operation. Because acoustic camera monitoring of the sluiceway entrances showed that many salmonids reject the entrances, design entrance hydraulic improvements (i.e., horned entrance shape).	2005
	Potential prototype testing.	2006
Behavioral Guidance System (BGS) – The BGS will assist in increasing juvenile and adult kelt passage through the spillway by reducing turbine entrainment of salmonids.	Initiate a detailed design for a BGS.	2005
	Design a permanent BGS to the spillway or a prototype design to potentially test.	2006
	A permanent BGS may be installed and tested if a prototype test is not necessary.	2007
Turbine rehabilitation	Scope and complete a study to evaluate a broader range of turbine improvements at The Dalles Dam, including assessment of turbine improvements for higher fish survival.	2005-2008
	Smooth and paint the wetted metal components of the Unit 9 turbine.	2005-2006
	Evaluate Unit 9 for potential increase in turbine operating efficiency and reduced juvenile injury rate. Field tests will include an evaluation of direct effects of turbine passage on juvenile salmonids, as well as total survival, for fish passing turbines at The Dalles Dam.	2006
East Fishway Auxiliary Water System (AWS)	Prepare plans and specifications for AWS spare parts to increase reliability of adult fish passage facilities, supporting maintenance of current high survival levels.	2006
John Day Dam		
Action Plan framework document – An Action Plan for fish passage improvements to improve juvenile survival. Following completion of the Action Plan framework document, the alternatives and/or schedule for the configuration actions listed below may be modified.	Complete an Action Plan for fish passage improvements. Alternatives include extended-length submersible bar screens, RSWs, skeleton bay surface bypass, BGS, JBS outfall relocation, hydro-combine, turbine improvements, and tailrace egress improvements.	June 2005

Project/Action	Objective/Deliverable	Planning Date[1]
Full flow bypass PIT detection – Full flow bypass PIT detection at John Day Dam will assist in reducing stress while still providing PIT detection when in full bypass mode. Currently fish PIT detection requires fish to go through a dewatering facility down to approximately 1 cfs for sampling. The purpose of the project is to provide PIT-tag detection on the full flow bypass flume.	Implement full bypass mode when collection and handling at the monitoring facility is not needed.	Not currently scheduled. Will be discussed in the Regional Forum.
McNary Dam		
RSW – We are proceeding with plans for improved juvenile survival through installation of an RSW at this project. Multiple bays may be required, with two assumed at this time. The purpose of the RSWs is to reduce juvenile forebay residence time, improve juvenile guidance and survival, and improve opportunities for increased power generation.	Initiate investigations and pre-design of RSW (assume two RSWs).	2005
	Conduct physical and numeric modeling, pre-engineering work, and environmental reviews.	2006
	Complete modeling and develop detailed specifications.	2007
	Move to construction, again assuming two RSWs.	2008-2010
Extended Submerged Bar Screens (ESBSs) – ESBSs were installed at McNary Dam in the spring of 1996 and 1997. The ESBS installation improves guidance of juvenile salmonids in the bypass facilities.	Design and implement several ESBS improvements. This will improve the reliability of the ESBS systems and improve juvenile survival.	2005
Flow deflectors and divider wall evaluations – A full complement of flow deflectors has recently been installed at McNary Dam. Additional gate hoists and spill operational plans are needed to optimize juvenile survival through the spillway.	Model the best configuration.	2005
	Develop a final plan.	2006
	Design/construct spillway divider wall as warranted.	2007-2008

Project/Action	Objective/Deliverable	Planning Date[1]
Forebay temperature improvements – During summer months, water temperature in the McNary forebay, gatewells, and fish collection channel are sometimes deleterious to fish survival and health. The Corps will examine potential improvements to juvenile survival through methods (both structural and operational) to alleviate or minimize the water temperature gradients, which can develop in the McNary forebay during the summer months.	Evaluate alternatives.	2005
	Develop a preliminary design.	2006
	Develop detailed plans and specifications.	2007
	Proceed with construction.	2008
Juvenile fish facility separator modification – In 2001, a prototype modification to the existing operational separator at McNary Dam was tested. The modification was installed at Lower Monumental juvenile fish facility with good success. The intent of this modification at McNary Dam is to decrease juvenile holding time below the separator and to provide better separation of Chinook and steelhead for transportation. This action will decrease stress on Chinook.	Install a modified separator at McNary Dam juvenile bypass system to decrease holding time at the separator and improve conditions for the transport program.	2006
Spillway gate rehabilitation – Rehabilitate four spillway gates to help meet the voluntary spill criteria for juvenile fish passage.	Complete rehabilitation of four spillway gates.	2005
North shore adult ladder PIT improvements – Installation of PIT-tag antennas in the adult ladder system will provide tracking and research capability of all returning adult salmon. The objective for monitoring the passage of adult salmon migrating upstream provides specific biological information regarding issues such as: (1) survival rates between dams and through the system; (2) partition interdam losses by factor; (3) assessing causal mechanisms associated with losses; (4) assessing reproductive success; and (5) identifying factors affecting passage, survival, and reproductive success. Evaluation of factors effecting upstream migratory efficiency will be utilized to reduce site-specific hindrances.	Prepare plans and specifications.	2005
	Construction.	2006

Project/Action	Objective/Deliverable	Planning Date[1]
Ice Harbor Dam		
RSW – RSWs have been identified as having potential to improve fish survival and spill efficiencies at Ice Harbor Dam. The purpose of the RSW is to implement an in-river passage system that improves passage conditions and spill efficiencies, maintains good passage without forebay delay, reduces dissolved gas, and improves opportunities for increased powerhouse generation.	Complete RSW fabrication, transport and installations, and biological testing.	2005
	Continue biological testing, RSW commissioning, and completion contracts.	2006
BGS Option – If the RSW studies in 2005 and 2006 determine insufficient spillway passage with the RSW, a BGS will be considered to increase the surface collection efficiency. A BGS would be a steel curtain across the forebay that creates both a hydraulic and physical plane to guide fish entering the forebay.	Possible design and construction of the BGS.	2006-2008
North Shore Fishway AWS – Adult fishway auxiliary water supply systems provide fish attraction water flows to help migrating adult salmonids find fish ladder entrances and to proceed up the fishways with minimum delay. The original configuration required that all three of the 250 cfs pumps run at one time to produce enough flow to keep the fishway in criteria. The new AWS system allows for the same criteria to be met utilizing only two of the three pumps. Having one pump spare capacity provides the opportunity for practicing preventive maintenance on idle equipment without requiring system operation outside of the criteria established in the fish passage plan.	Replace bearings for this fishway, improving its ability to maintain adult performance standards.	2005
Juvenile PIT-tag detector on the main fish transportation – This detector will allow estimation of steelhead and yearling Chinook reach survival rates and provide passage data on all PIT-tagged salmon.	Install full flow PIT-tag detector by April on the 36-inch diameter pipe on the main transportation flume to the Ice Harbor juvenile fish facility.	2005
Lower Monumental Dam		
RSW – An Action Plan is being developed for the Lower Monumental RSW to evaluate the juvenile survival improvements. The purpose of the RSW is to implement an in-river passage system that improves passage conditions and spill efficiencies, maintains good passage without forebay delay, reduces dissolved gas, and improves opportunities for increased powerhouse generation.	RSW design development, plans, and specifications.	2005
	RSW construction and biological post construction evaluations.	2007-2008
AWS – Adult fishway auxiliary water supply systems provide fish attraction water flows to help migrating adult salmonids to find fish ladder entrances and to proceed up the fishways with minimum delay. The adult fishway auxiliary water supply system at Lower Monumental Dam has no spare or emergency capacity. An auxiliary water supply will support continued maintenance of adult performance standards.	Develop report for emergency operation and improvements to fishway system.	2005
	Implement upgrades to existing system.	2006
BGS Option – BGS, powerhouse occlusion, and trash debris booms or similar devices may increase juvenile fish guidance, in-river passage and survival at hydropower projects. A BGS is an option to improve survival, depending on the outcome of the RSW evaluations.	If appropriate, initiate BGS design.	2008 Pending RSW biological study results

Project/Action	Objective/Deliverable	Planning Date[1]
JBS outfall and divider wall – Evaluate the relocation of the existing JBS outfall and investigate the potential benefits and costs of installation of a powerhouse/ spillway divider wall. The intent of a divider wall is to improve juvenile egress through the tailrace and improve total dissolved gas (TDG).	Conduct model studies.	2005
	Prepare technical report.	2006
	Design and construct divider wall and relocate outfall if warranted.	2007-2008
Juvenile Fish Barge Loading Improvements – There is a noticeable trend of lower survival for fish transported from this location versus Lower Granite and Little Goose. The scope of this project is to determine the potential causes for lower survival of transported fish at Lower Monumental, develop solutions, and implement the improvements to survival of juvenile fish.	Investigate causes and develop options for improvements to the collection and transport system	2005
Spillway parapet walls – Design and construct parapet walls on the north and south side of Lower Monumental spillway to mitigate for wave actions that saturate the north and south tailrace decks caused by new deflector installation on bays 1 and 8.	Construct parapet walls.	2005
Juvenile PIT-tag detector on the main fish transportation flume – The purpose of the project is to provide PIT-tag detection on the full flow 30 cfs bypass flume. This would be done utilizing design elements from the McNary project completed in (fiscal year) FY 2002 and revisions to some of these items planned for Ice Harbor. This project will improve survival and detection of Snake River fish.	Prepare design and specifications.	2006
	Initiate and complete construction.	2007
Little Goose Dam		
RSW – As noted previously, RSWs have potential to improve juvenile fish survival as well as provide opportunities for increased power generation.	Initiate investigations and pre-design of RSW.	2005
	Complete design development, plans, and specifications.	2006
	Complete construction and conduct post-construction biological tests if schedule allows.	2007-2008
	Conduct post-construction evaluation as warranted.	2009
AWS – Adult fishway AWS systems provide fish attraction water flows to help migrating adult salmonids to find fish ladder entrances and to proceed up the fishways with minimum delay. The AWS system at Little Goose has no spare or emergency capacity and requires modifications to operate in accordance with the actions set forth in the BiOp and UPA. Plans have been designed and are awaiting the outcome of hydraulic analysis.	Develop report for emergency operation and improvements to fishway system.	2006
	Implement upgrade to existing system.	2007
ESBSs – ESBSs were installed at Little Goose in the spring of 1996. Many of the operational problems initially encountered, such as the brush control systems, have been corrected. Additional measures are needed to ensure reliability of the ESBS system.	Complete installation of ESBS chains.	2005
Flow Deflectors and Divider Wall Evaluations – In order to improve water quality for migrating fish, we will construct two additional deflectors on Little Goose spillway to reduce TDG during spillway operations.	Conduct preliminary work.	2005-2007
	Construct deflectors.	2008

Project/Action	Objective/Deliverable	Planning Date[1]
Full flow juvenile PIT monitoring – The Corps will identify actions to design, fabricate, and install a PIT-tag detector capable of performing on a 30/36-inch diameter pipe on the main transportation flume to the Little Goose juvenile fish facility. The purpose of the project is to provide PIT-tag detection on the full flow 30/36 cfs bypass flume.	Prepare design, plans, and specifications; manage project; and award contract.	2006
	Complete construction.	2007
Lower Granite Dam		
ESBSs – ESBSs were installed at Lower Granite in the spring of 1996. Additional measures are needed to ensure reliability of the ESBS system.	Complete installation of ESBS chains.	2005
BGS – RSW has been installed and operated at Lower Granite since 2004. Testing is planned in 2005 to determine the effectiveness of the prototype BGS to improve guidance of fish to the RSW.	If warranted, begin design of BGS or an enhancement for surface bypass.	2006
Divider Wall Evaluations – The divider walls have the potential to improve tailrace egress for juvenile passage and reduce TDG during spillway operations.	Begin evaluation of a divider wall at Lower Granite Dam.	2007
JBS – Develop plans and specifications to modify the existing juvenile fish facilities at Lower Granite Lock and Dam and construction of the modifications.	Develop design documents.	2005
	Develop plans and specifications.	2006
	Initiate construction.	2007-2008
Chief Joseph Dam		
Spillway deflectors – Construction of armoring along the right bank below the dam to prevent erosion associated with increased spill will begin in spring 2005.	Award a contract to construct spillway deflectors.	2005
	Construct spillway deflectors.	2005-2008
	Complete construction and installation of spillway deflectors.	2008

Measures that Address Temperature and Dissolved Gas

The Water Quality Plan (WQP) was included by NOAA Fisheries as a conservation recommendation in the FCRPS 2000 BiOp. The purpose of this plan was to develop a comprehensive strategy of both structural and operational improvements to reduce Total Dissolved Gas (TDG) and temperature for the benefit of anadromous fish species and to further Clean Water Act (CWA) objectives. The specific goals of the plan were to:

- Assist in our understanding of systemwide loading capacity and loading allocation by assessing the existing effects at Federal and non-Federal dams and tributaries.
- Provide an organized, coordinated approach to improving water quality, with the goal of moving toward attainment of applicable state and Tribal water quality standards to support the designated uses.
- Provide a framework for identifying, evaluating, and implementing reasonable actions for dam operators to use as they work toward reducing temperature and TDG levels.
- Provide a forum for discussing actions and the feasibility of structural and operational improvements aimed at improving water quality conditions. This information may provide a basis for future beneficial use and water quality criteria revisions.

Over the long term, the WQP anticipates that the Environmental Protection Agency (EPA), NOAA Fisheries, and the Action Agencies and the state water quality agencies will integrate WQP implementation into ongoing Total Maximum Daily Load (TMDL) development activities on the mainstem and in the subbasins.

The first version of the WQP was completed in April 2003, then updated in December 2003 as part of the annual water quality report to the states of Oregon and Washington. The WQP will be updated periodically to reflect progress on structural and operational measures. Currently, the WQP is scheduled to be revised in 2007 to be consistent with the State of Oregon and Washington water quality processes. This plan was developed in coordination with the Water Quality Team of the Regional Forum. Please refer to the WQP for specific information and implementation details.

Project Configuration RM&E

The Action Agencies will continue a wide range of hydrosystem studies to evaluate and improve juvenile and adult fish passage survival. The majority of these studies are action effectiveness studies that evaluate specific actions at the hydrosystem projects. The focus of these studies is to provide:

- Information necessary to design, build, modify, and operate fish passage facilities;
- Baseline information on passage efficiencies and survival through projects; and
- Post-construction evaluation of new or modified passage facilities.

For further implementation details, see the Hydrosystem RM&E Section V.

Manage Water to Improve Juvenile and Adult Fish Survival

The Action Agencies' goal for 2005-2007 is to implement water management measures to benefit juvenile and adult survival consistent with other project purposes and available water supply. These measures include system flow objectives for juvenile fish migration, reservoir operations to help meet needs of fish at or near the project, spill for juvenile fish passage, and other aspects of water management.

Each year, the Action Agencies manage a varying amount of natural flow that enters the FCRPS as runoff from precipitation and melting snowpack. This water is used to meet multiple purposes, including irrigation, flood control, power production, fish and wildlife, navigation, and recreation. The Action Agencies expect to implement the water-management measures for fish survival in the 2004 UPA and the 2000 USFWS BiOp under most water conditions.

Near-term priority (2007): Implement water management measures toward achieving identified juvenile and adult system survival goals.

Long-term priority (2010): As configuration objectives are achieved at Columbia and Snake River dams, the Action Agencies will continue to implement water management measures to achieve identified juvenile and adult system survival goals and optimize the opportunities for increased powerhouse generation that arise concurrently with completed configuration improvements.

Reservoir Operations, System Flow Management, and Spill Operations to Improve Fish Survival

The Action Agencies will prepare an annual Water Management Plan (WMP) as part of the implementation planning process outlined in the 2004 UPA and BiOp and the 2000 USFWS BiOp concerning the operation of FCRPS dams. The WMP will describe how the FCRPS dams and reservoirs will be operated for the upcoming water year (October 1 through September 30) in a manner consistent with the actions in the 2004 UPA and BiOp and in the 2000 USFWS BiOp while also providing for all congressionally authorized project purposes such as flood control, hydropower, irrigation, navigation, fish and wildlife, and recreation. The Action Agencies will begin with implementation of the project-specific operations described in the UPA, Table 2, pp. 46-47.

The annual WMP will generally be drafted in July and completed by the end of September. The WMP will include general descriptions of FCRPS operations and any special operations (fish passage studies, special tests, navigation, flood control procedures planned for the year, etc.) that are known at the time the plan is developed. The Action Agencies will also develop two detailed updates to describe how the FCRPS projects will be operated for ESA-listed species under actual conditions with current water supply forecasts. The first action plan will be drafted in October and finalized in December to address the fall/winter operation of the FCRPS projects. A spring update will be drafted in January and finalized in April to address the spring and summer operation of the FCRPS projects. These updates will take into account changes in the UPA and other factors at the time of preparation. The WMP and updates will be coordinated through the Technical Management Team (TMT). Draft review comments from TMT members will be considered in preparing the final WMP and updates. The WMP, updates, and reviewer comments are available on the web at http://www.nwd-wc.usace.army.mil/tmt/documents/wmp/.

Reservoir Operations

- Projects will provide recommended minimum outflows.
- Outflow fluctuations will be limited to avoid stranding fish.
- Lower Snake River reservoirs are planned to be operated at minimum operating pool (MOP) and John Day reservoir near its minimum irrigation pool to reduce cross-sectional area and increase water velocity.
- Temperature of water releases from storage projects will be regulated to improve water temperatures for fish as feasible.
- Explore summer reservoir operations at Libby and Hungry Horse, as recommended by the Council, to assess benefits to resident fish needs. Based upon study findings and consistency with the USFWS BiOp, a long-term summer reservoir operation would be developed for these sites.

System Flow Management

- Operate reservoirs to meet reservoir operation objectives outlined in the WMP.
- Operate storage projects to be at their April 10 flood control elevation to provide for flow augmentation for the spring salmonid migration.
- Refill the storage projects by approximately June 30 to provide summer flow augmentation.
- Provide fall and winter tailwater elevations/flows for chum salmon spawning and incubation.
- Operate Libby to provide for Kootenai River white sturgeon and bull trout.

The Action Agencies expect the following outcomes to be achieved annually:

- Available storage will be used to augment juvenile migration flows, although seasonal flow objectives will not be met in all years at all times during migration season.
- Adult and juvenile mainstem passage survival performance standards will be met.
- The Action Agencies will draft Dworshak to 1520 feet in September.

Spill Operations

- Establishment of a long-term operation for the new Ice Harbor RSW.
- Development of a long-term operation (begin and end dates) for the Bonneville second powerhouse corner collector based upon operational tests.

- May explore summer spill operations to determine if the biological objectives of the BiOp can be achieved at lower cost, as recommended by the Council, will be developed and implemented if feasible. Revised project operations will be established if study results support it.

Operate and Maintain (O&M) Fish Passage Facilities to Improve Fish Survival

Anadromous fish passage facilities, such as fish ladders and bypasses and/or mitigation hatcheries, were provided at the time many FCRPS projects were built. The original facilities have been updated and new facilities, such as bypass systems, collection and transport facilities, PIT-tag detection systems, and TDG monitoring equipment, have been added at the dams. The Corps District Offices in Seattle, Walla Walla, and Portland coordinate O&M activities at the dams. Each dam has a staff to carry out day-to-day O&M requirements. The Fish Passage Operations and Maintenance Team (FPOM) consisting of federal, state and Tribal representatives, develops operational priorities and operating criteria that are summarized in the Fish Passage Plan (FPP). This plan is updated annually and implemented by project personnel and others involved with river operations. It can be referenced at http://www.nwd-wc.usace.army.mil/tmt/documents/fpp/fpp2002.pdf.

O&M tasks are categorized and implemented as follows: routine O&M, non-routine O&M that includes capital improvements, juvenile fish transportation, and operations RM&E.

Near-term priority (2007): Implement preventive maintenance programs to ensure the long-term reliability of fish passage facilities.

Long-term priority (2010): Minimize facility outages and ensure long-term reliability of fish passage facilities.

Routine and Non-Routine Maintenance of Fish Passage Facilities

Routine O&M will follow procedures identified in the annual FPP. The plan will be revised annually in coordination with the FPOM committee.

Non-routine O&M activities are one-time activities or are very extensive and so are differentiated from routine O&M. Table 4 lists the non-routine O&M activities that the Corps plans to implement at specific dams for the 2005-2007 timeframe.

Table 4 Non-Routine Fish Passage Facilities O&M

Project/Action	Planning Dates
All dams	
Continue to acquire the necessary spare parts to minimize facility outages due to equipment failures.	Ongoing
Review rehabilitation needs of adult fish counting system at each project and develop plans for necessary work.	Ongoing
Report real-time data on turbine and spillway settings on the internet.	Ongoing
Continue to implement and improve avian predation deterrent program at all projects.	Ongoing
Annually monitor for invasive species at all projects.	Ongoing
Continue program to identify and remove obstructions that may injure fish.	Ongoing
Bonneville Dam	
Implement new fish counting.	2005
Maintenance of new adult PIT system.	2005

Project/Action	Planning Dates
Purchase spare parts for adult AWS.	2005-2006
Rehabilitate main turbine units 2, 8, and 10 at the Bonneville 1st Powerhouse main units.	2005-2008
Continue ongoing turbine obstruction removal as units become available.	Ongoing
Develop and improve preventive maintenance on fish facilities.	Ongoing
Dredge Bradford Island adult fish exit.	2007
Dredge forebay if needed.	2007
Refurbish submersible traveling screens (STS) at Bonneville 2nd Powerhouse.	2005-2009
The Dalles Dam	
Implement new fish counting.	2005
Rehabilitate the north shore fishway AWS.	2005
Repair or replace spillway gate cables as necessary.	2005
Remove turbine obstructions.	2005-2007
Purchase spare parts for adult AWS.	2005-2006
Hydraulic evaluation of adult fishway system.	2006
Install Generic Data Acquisition and Control System (GDACS) fishway control system.	2006
Repair adult passage system diffuser gratings on the East ladder .	2007
John Day Dam	
Implement new fish counting.	2005
Upgrades to north fishway counting system.	2005-2006
Upgrade to GDACS system.	2005-2006
Maintain fish facilities spare parts.	2005-2006
Overhaul the STS.	2005-2007
Rehabilitate south fishway turbine.	2005-2007
Modify turbine scroll case/draft tube.	2005-2007
Remove obstructions from turbine environment.	2005-2007
Treat mitigation hatchery wells.	2006-2008
McNary Dam	
Debris handling.	2005-2009
Implement preventive maintenance program.	2005-2009
Overhaul ESBS.	2005-2009
Replace vertical barrier screen mesh.	2005-2009
Ice Harbor Dam	
Replace adult entrances and hoists.	2008
Rehabilitate diffuser valves and operators.	2005-2006
Rehabilitate south shore fish pumps.	2006-2009
Implement preventive maintenance program.	2005-2009
Debris handling.	2006-2009
Maintain fish facility spare parts.	2006-2007
Purchase STS mesh and chain parts.	2006-2007
Lower Monumental Dam	
Rehabilitate fish counting stations.	2005
Rehabilitate south shore auxiliary water regulating gate.	2005-2006
Implement preventive maintenance program.	2005-2009
Debris handling.	2005-2009
Maintain fish facility spare parts.	2007-2008
Purchase STS mesh and chain parts.	2007-2008
Little Goose Dam	
Implement preventive maintenance program.	2005-2009
Maintain fish facility spare parts.	2007-2008
Debris handling.	2005-2006
Overhaul ESBS.	2005-2007

Project/Action	Planning Dates
Rehabilitate fish pumps.	2006-2008
Lower Granite Dam	
Debris handling.	2005-2009
Overhaul ESBS.	2005-2007
Implement preventive maintenance program.	2005-2009
Rehabilitate fish counting stations.	2007-2008
Fish facility spare parts.	2007-2009

Juvenile Fish Transport Actions to Improve Fish Survival

The Corps will continue to collect and transport juvenile salmonids at Lower Granite, Little Goose, Lower Monumental, and McNary Dams per the annual FPP.

When average seasonal flows are expected to equal or exceed 70 kcfs, transportation collection will begin by April 20, and any fish collected before April 20 will be bypassed back to the river.

When seasonal flows are expected to be less than 70 kcfs, transportation will be maximized when juvenile bypass systems begin operation. The Action Agencies will also continue increased summer barging through August 15.

Juvenile Fish Transportation Operations RM&E

The Action Agencies will continue to conduct RM&E to provide information on juvenile fish transportation and delayed mortality. See the Hydrosystem RM&E Actions in Section V for implementation details.

B. Predator Control Actions

ESUs benefited: Avian and pisciverous (fish) predator control actions are targeted to provide survival improvements for all or most listed ESUs. However, the avian predator control actions have little to no effect on Columbia River chum salmon.

Redistribute Avian Predators

Near-term priority (2007): Develop out-of-Columbia River Basin Caspian tern habitat and reduce the available habitat on East Sand Island (work will be done in accordance with the Records of Decision [RODs] for the final EIS decision documents and implementation plan being developed for this action).

Long-term priority (2010): Reduce the Caspian tern colony in the Columbia River estuary to 1,250 – 3,125 nesting pairs. Create approximately 8 acres of offsite habitat and reduce suitable nesting habitat remaining on East Sand Island to 1 to 1½ acres. Based on completed research and in-depth analysis, begin implementing measures to disperse double-crested cormorant population and manage their predation of juvenile salmonids. Finally, if in response to ongoing research NOAA Fisheries determines that management of the Caspian tern colony on Crescent Island in the Mid-Columbia is warranted, management alternatives and their implementation will be determined in conjunction with the USFWS, which is responsible for the management of Crescent Island.

Redistribute Caspian Terns Nesting on East Sand Island in the Columbia River Estuary to Habitats Located Outside of the Columbia River Basins

In the UPA, the Action Agencies committed to implement the following actions:

- Complete the Caspian Tern Final EIS in February 2005 and issue RODs by relevant agencies in spring 2005.
- Complete an implementation plan for the selected alternative by spring 2005 in coordination with relevant entities.
- Initiate implementation of the selected alternative in FY 2005 and monitor results.
- Measure the annual Caspian tern predation rates on juvenile salmonids and the resulting juvenile salmonid survival rates.
- Continue the RM&E program to determine the effects of tern redistribution on colony size, annual level of reproductive success, and annual consumption levels of juvenile salmonids by Caspian terns remaining on East Sand Island.
- Validate the assumption that there is a linear relationship between the number of terns nesting on East Sand Island and the number of juveniles salmonids consumed.
- Continue and expand research efforts to determine whether or not other avian predators nesting on East Sand Island are compensating for the decrease in juvenile salmonid consumption by the redistribution of Caspian terns.

The near-term implementation actions to support our UPA commitments are shown in Table 5.

Table 5 Caspian Tern Redistribution Actions [CORPS ADD IN INFO FROM PIT TAG PROJ. ETC]

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Caspian Tern Final EIS Implementation Plan (Corps/BPA)	• The Corps and BPA will issue decision documents for the Caspian Tern EIS in spring 2005. • The Corps, BPA, and USFWS are currently developing a Caspian tern implementation plan (based on the Caspian Tern Final EIS) to determine agency roles and responsibilities.
Project No. 1997-024-00, Avian Predation on Juvenile Salmonids in the Lower Columbia River (BPA)	• Determine the size, habitat use, and nesting success of the Caspian tern colony on East Sand Island. • Determine diet composition and consumption of juvenile salmonids by Caspian terns nesting on East Sand Island. • Detect any formation of new Caspian tern colonies at other dredged material disposal sites in the estuary. • Determine the accuracy of tern predation rates on salmonids based on smolt PIT-tag recoveries on colony. • Determine the relative importance of factors that influence the vulnerability of juvenile salmonids to predation by terns in the estuary (e.g., salmonid species, ESU, and stock). • Determine the colony size, habitat use, nesting success, and diet composition of double-crested cormorants nesting on East Sand Island to determine if they are compensating for the decrease in the juvenile salmonid consumption by the redistribution of Caspian terns.

Analyze the Double–Crested Cormorant Population in the Columbia River, and Evaluate and Implement Alternatives to Manage the Cormorant Population

In the UPA, the Corps and BPA committed to implement the following actions:

- Continue research efforts to better understand cormorant predation on juvenile salmonids initial studies; and,
- To investigate the regional double-crested cormorant population and potential management measures to disperse that population.

The near-term implementation actions to support our commitments are shown in Table 6.

Table 6 Double-Crested Cormorant Actions

Project Title & Responsible Agency	2005-2007 deliverable/objective
Project No. 1997-024-00, Avian Predation on Juvenile Salmonids in the Lower Columbia River (BPA)	• Determine the colony size, habitat use, and nesting success of double-crested cormorants nesting on East Sand Island. • Determine diet composition and consumption of juvenile salmonids by cormorants nesting on East Sand Island. • Survey and monitor the size, nesting success, and the diet composition of colonies of double-crested cormorants at other sites in the estuary and at Foundation Island in the Mid-Columbia.
Develop Double-crested Cormorant Management Alternatives (Corps/BPA)	• Determine the accuracy of cormorant predation rates on salmonids based on smolt PIT-tag recoveries on colony. • Determine the relative importance of factors that influence the vulnerability of juvenile salmonids to predation by cormorants in the estuary (e.g., salmonid species, ESU, and stock). • As our knowledge of the cormorants regionally and on East Sand Island increases, we will investigate different management alternatives to reduce cormorant predation on juvenile salmonids.

Perform Analysis of the Caspian Tern Population of the Mid-Columbia River, and Evaluate and Implement Alternatives to Manage the Tern Population

In the UPA, the Corps and BPA committed to work with the USFWS to begin the environmental review of potential management alternatives to manage the Caspian tern population in the mid-Columbia River.

The near-term implementation actions to support our commitment are shown in Table 7.

Table 7 Caspian Tern Analysis

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Project No. 1997-024-00, Avian Predation on Juvenile Salmonids in the Lower Columbia River (BPA)	• Determine the size, habitat use, and nesting success of Caspian tern colony on Crescent Island. • Determine diet composition and consumption of juvenile salmonids by Caspian terns nesting on Crescent Island. • Detect any formation of new Caspian tern colonies on other islands in the Mid-Columbia River. • Determine the accuracy of tern predation rates on salmonids based on smolt PIT-tag recoveries on colony. • Determine the relative importance of factors that influence the vulnerability of juvenile salmonids to predation by terns at Crescent Island (e.g., salmonid species, ESU, and stock).

Reduce Fish Predation

Near-term priority (2007): Increase the base reward structure for the Sport-Reward component of the base Northern Pikeminnow Management Program (NPMP) to sustain exploitation rates observed during the program 'heavy-up' in 2004 in order to increase annual and cumulative juvenile survival rates for most ESUs, especially Snake River fall Chinook. Test the feasibility of increasing tagging and evaluation activities to refine project estimates. If these efforts increase the precision of evaluative measurements, then the Action Agencies will pursue quantitative crediting mechanisms through the adaptive management process outlined in the UPA.

Long-term priority (2010): Reduce the number of larger, predatory fish throughout the mainstem Columbia and Snake rivers and provide systemwide enhancement and benefit to all ESUs.

Expanded Northern Pikeminnow Management Program (NPMP)

In the UPA, BPA committed to:

- Continue the base NPMP and add a general increase in the reward structure in the Sport-Reward fishery similar to that of 2001 and 2004.
- Achieve increased emphasis in the sport reward fishery in Little Goose and Lower Granite reservoirs to benefit listed Snake River Chinook.
- Model estimates of the increased exploitation rate's effect on reduction in predator mortality.
- Increase number of tagged fish to enhance the estimation and evaluation of the NPMP.
- Enhance reservoir specific measures to address "hot spots" of salmonid predation (could include contracting for site-specific removals within project boat restricted zones).

The near-term implementation actions to support our UPA commitment are shown in Table 8.

Table 8 NPMP Actions

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Project No.1990-077-00, Northern Pikeminnow Management Program (BPA)	• Maintain 2004 increased reward structure. • Achieve a 15% average exploitation rate by increasing the financial rewards for tagged fish caught in Little Goose and Lower Granite reservoirs. • Continue the existing efforts to model estimates of the effect on juvenile mortality from increased exploitation of northern pikeminnow. • Apply additional resources to enable the tagging of more fish and increase the quality of evaluations. • Conduct site-specific removals using an incentive-based approach.

Other Fish Predators

In the UPA, BPA committed to:

- Add focused pikeminnow removals at Bonneville, The Dalles, and John Day dams/forebay and tailrace boat restricted zones.
- Based upon results of 2004 full evaluation of the NPMP, use the specific removals within project/reservoir boat restricted zones to test removals of other non-indigenous predators – specifically smallmouth bass (*Micropoterus dolomieu)*.
- If tests are successful in 2005, scope possible continuation and/or expansion of test removals into a management action.

- Complete the required environmental documentation associated with potential management alternatives by the end of 2007.
- Develop measurement and crediting mechanisms associated with site-specific removals of non-indigenous predators by 2007.

The near-term implementation actions to support our commitment are shown in Table 9.

Table 9 Other Fish Predation Actions

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Project No. 1990-077-00, Northern Pikeminnow Management Program	• Conduct site-specific removals using an incentive-based approach. • Test the removal of other juvenile fish predators while conducting the site-specific removals. • Work with regional entities to expand efforts to remove other juvenile fish predators if the tests indicate that we could effectively target and remove them on a large scale. • Additional activities are already covered under range of alternatives within current environmental assessment (EA)/Finding of No Significant Impact (FONSI) and separate biological opinion for pikeminnow removals. • Develop measurement and crediting mechanisms for site-specific removals of non-indigenous predators through the current infrastructure of the NPMP.

C. Estuary Habitat Protection and Improvement

ESUs benefited: Estuary habitat protection and improvement actions are primarily focused on improving survival of Snake River fall Chinook, but should also benefit all of the Columbia River ESUs as they migrate through the estuary.

The estuary habitat actions are being accomplished by the Corps and BPA under existing programs. Corps authorities for ecosystem restoration generally require a local sponsor, and that sponsor is responsible for acquisition of any property required for the project. For the estuary actions, BPA generally funds the acquisition and also some improvement actions and monitoring through the Council's Fish and Wildlife program. The Corps is generally responsible for planning, engineering, and design and for restoration and creation actions.

Near-term priorities (2007):

- Protect, restore, enhance, create, and conserve shallow water and wetland habitats in five of the six proposed projects.
- Continue feasibility study for the sixth project. Continue to investigate and implement actions based on the estuary action plans.
- Conduct action effectiveness monitoring associated with the estuary projects to improve understanding of the relative value of these habitats to listed ESUs, and compare these values to other geographic areas in the Columbia River Basin.

Long-term priorities (2010):

- Complete the sixth proposed project (Chinook) and implement estuary habitat actions that provide the greatest biological benefit to listed ESUs. Additional projects and needs will be identified based on research and regional coordination and developed following the Action Agencies' restoration plan.

- Improve side channel and off-channel habitat in the upper fresh water portion of the estuary, (river mile 46 to river mile 146).
- Document changes to the estuary program through annual progress reports, including status of the actions being taken, the acres of shallow water habitat restored, new information related to the overall effect of the proposed action on shallow water habitat, as well as new information (empirical studies) contributing to an understanding of the value of shallow water habitat as a component of critical habitat. After three years of implementing the estuary program, reevaluate the results and revise the actions as appropriate.

Protect Estuary Habitat

The Action Agencies will continue to implement or pursue implementation of the six key habitat restoration projects as shown in Table 10.

Table 10 Estuary Habitat Projects

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Crims Island – BPA funded the purchase of 473 acres in 2004 through the Council's Fish and Wildlife program (Project No.2003-008-00). This property will continue to be protected from other uses. Habitat improvements were initiated in 2004, and baseline and post-construction monitoring will be conducted.	Continue baseline monitoring.
	Continue restoration and creation of 208 acres of intertidal marsh, sub-tidal channels, and riparian forest through excavation and plantings. Complete in 2006.
Sandy River – The Corps and BPA efforts will contribute towards along-term effort to restore 1,500 acres of the Sandy River Delta in the Columbia River Gorge National Scenic Area. BPA-funded efforts will occur under Project No. 1999-025-00.	Continue investigations and design, including determination of whether partial reconnection using culverts or full connection using a bridge is warranted. Complete NEPA in 2005.
	Restore 90 acres of native hardwood riparian forest and 20 acres of a seasonally wet slough. Begin site preparation and exotic species eradication in 2005. Complete planting in 2006.
	Conduct Research to determine benefits to Snake River fall Chinook.
Germany Creek – BPA is funding implementation of this project through Project No. 2003-011-00.	Complete appraisal, title, NEPA , Section 7 consultation and acquisition of 155 acres of critical riparian and floodplain habitat along the lower one mile of Germany Creek in 2005.
	Begin restoration, creation, and enhancement actions on approximately 250 feet of an old creek channel to provide chum salmon spawning habitat and approximately 2.5 acres of off-channel rearing habitat for a variety of salmonid populations in the summer of 2005 with completion in the fall of 2005.

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Fort Columbia Wetland - BPA funded efforts will occur under Project No. 2003-011-00.	Begin planning and design analysis phase and complete Section 7 consultation and NEPA in 2005.
	Restore approximately 96 acres of tidal wetland habitats in the Chinook River watershed by reestablishing the connection between the distributary of the Chinook River and its associated wetlands and floodplain with the greater Columbia River estuary beginning in 2006 or 2007.
Grays River – 880 acres of habitat lands, including spruce swamp forested wetlands, inter-tidal floodplain channels and emergent scrub-shrub wetlands have been acquired for protection, conservation and restoration. BPA funded efforts will occur under Project No. 2003-011-00.	Complete planning and design, NEPA and Section 7 consultation in early 2005.
	Protect and restore over 800 acres of potential salmonid rearing habitat on tidal wetlands and flood plains by acquisition, plantings, and breaching, and removing dikes.
Chinook River - BPA funded efforts will occur under Project No. 2003-00-600.	Coordination, planning, engineering and design efforts will continue through the near-term period leading toward restoration and enhancement of approximately 800 acres by 2010.

Estuary RM&E: The Action Agencies' *Plan for Research, Monitoring, and Evaluation of Salmon in the Columbia River Estuary* (Plan) was produced in response to the 2000 FCRPS BiOp. Estuary RM&E actions are discussed in the RM&E section of this document.

D. Tributary Habitat Protection and Improvement Actions

Tributary habitat protection and improvement actions were included in the UPA to augment hydrosystem, predator control, and estuary habitat actions for Upper Columbia River spring Chinook and Upper Columbia River steelhead ESUs. Additional conservation measures were included in the UPA to improve survival, but are not required to avoid jeopardy. Conservation measures for Upper Columbia steelhead in the Okanogan subbasin were included by BPA. Conservation measures for Mid-Columbia steelhead in the Upper John Day, Middle Fork John Day, and North Fork John Day; and for Snake River spring/summer Chinook and Snake River steelhead in the Lemhi, Upper Salmon, and Little Salmon subbasins were included by Reclamation.

The following tables identify metrics for lists of known projects and summarize metrics for additional anticipated projects to meet or exceed the near-term (2007) priorities. Habitat projects are conducted in cooperation with private landowners and often require additional coordination among a wide array of State, Federal, and local agencies. The list of known projects indicates that construction funding has been secured, and all participants have agreed to complete the project. Preliminary work has been initiated on additional anticipated projects for the ESUs listed below, but specific identification of projects at this time could impair project completion. Consequently, only summary metrics are reported for additional anticipated projects.

Upper Columbia River Spring Chinook and Upper Columbia River Steelhead

Streamflow, Entrainment, Channel Morphology, and Riparian Protection and Enhancement Actions

Near-term priority (2007): In the Wenatchee Entiat, and Methow subbasins, lease, purchase, and/or conserve 12 cfs of water; resolve 5 irrigation diversion screen problems; restore 60 miles of tributary

access; restore 5 miles of complexity; protect 4 miles of riparian habitat, and enhance 6 miles of riparian habitat through 13 known and 26 additional anticipated projects.

Long-term priority (2010): In the Wenatchee, Entiat, and Methow subbasins, lease, purchase, and/or conserve 40 cfs of water; resolve 10 irrigation diversion screen problems; restore 105 miles of tributary access; restore 10 miles of complexity; protect 12 miles of riparian habitat, and enhance 12 miles of riparian habitat.

Table 11 Habitat Metrics for List of Known Projects and Estimates for Anticipated Projects for Upper Columbia ESUs

Project Name	Agency	CFS to acquire	# of screens	Miles of access	Miles of complexity	Miles protected	Miles enhanced
MVID East Canal Fish Screens	BPA/USBR		1.0				
Hottell Fish Screen	BPA/USBR		1.0				
Marracci Diversion Reconstruction	BPA/USBR			21.8			
Fulton Diversion Structure	BPA/USBR			30.1			
Chewuch Ditch Diversion Structure	BPA/USBR			22.8			
Rockview Channel Reconnect	USBR				0.7		
MSRF Twisp Ponds Reconnection	BPA/USBR				0.8		
McPherson Channel Reconnection	BPA/USBR				1.0		
Whitehall Unscreened Surface Pump Elimination	BPA/USBR		1.0				
Entiat 4 Mile Push-up Dam Replacement and Screen	BPA/USBR		1.0				
Water Entity Project (CBWTP and Riparian Easement)	BPA	5.0				5.0	
Jones Shotwell Ditch	USBR		1.0		0.2		
Peshastin Irrigation District Lower Diversion	USBR			2.4			
Metrics Total for Contracted Projects		**5.0**	**5.0**	**77.1**	**2.7**	**5.0**	**0.0**
Metrics Totals for Anticipated Additional Projects for Completion by 2007		**13.0**	**2.0**	**100.0**	**4.8**	**4.4**	**7.6**
Grand Total		**18.0**	**7.0**	**177.1**	**7.4**	**9.4**	**7.6**
Near-term Metric Goal by 2007		**12.0**	**5.0**	**60.0**	**5.0**	**4.0**	**4.0**
Long-term Metric Goal by 2010		**40.0**	**10.0**	**105.0**	**10.0**	**12.0**	**12.0**

Conservation Measures

Upper Columbia River Steelhead

Streamflow and Riparian Protection and Enhancement (BPA Conservation Measure)

Near-term priority (2007): Enhance riparian habitat and improve flows through instream water transactions in the Okanogan subbasin to improve survival of Upper Columbia River steelhead.

Long-term priority (2010): Improve spawning and rearing habitat for Upper Columbia River steelhead in the Okanogan subbasin.

BPA is considering implementation of proposals from the Colville tribes for work in the Okanogan subbasin to benefit Upper Columbia River steelhead. These proposals include work to improve fish habitat through passage and culvert improvements at Mission Falls and the Omak Creek watershed, and a feasibility study for improving fish passage at McIntyre Dam. BPA will be considering these proposals in coordination with the Council.

BPA will continue to implement the Columbia Basin Water Transactions Program (CBWTP) under the BPA Water Entity Project No. 2002-013-01 with the Columbia Cascade ecological province as a focus

area. The Washington Water Trust is actively working to develop water acquisitions in the Okanogan as part of the project.

BPA will also implement a riparian easement program in 2005 in conjunction with the National Fish and Wildlife Foundation and various other entities. This initiative is anticipated to provide riparian protection in several Columbia Cascade subbasins, including the Okanogan.

Mid-Columbia River Steelhead

Reclamation will implement conservation measures to improve tributary spawning and rearing habitat for Mid-Columbia steelhead.

Streamflow, Entrainment, and Channel Morphology (Reclamation Conservation Measures)

Near-term priority (2007): In the North Fork, Middle Fork, and Upper John Day subbasins, lease, purchase, and/or conserve 7 cfs of water; and provide technical assistance to resolve 30 irrigation diversion screen problems; restore 24 miles of tributary access; and restore 3 miles of complexity through 12 known and 8 additional anticipated projects.

Long-term priority (2010): No long-term tributary habitat priorities were identified in the UPA for this ESU. However, the Action Agencies may add priorities using the adaptive management framework if action effectiveness monitoring indicates it would provide needed biological benefits to the ESU.

Table 12 Habitat Metrics for List of Known Projects and Estimates for Anticipated Projects for Mid-Columbia ESUs

Project Name & Number	Agency	CFS to acquire	# of screens	Miles of access	Miles of complexity
Paul's Water Lease	USBR	1.4			
Cummings Creek Flow Restoration	USBR	0.3			
Holliday Ranch McKinney Creek Siphon	USBR	0.3	1.0	3.0	
Holliday Ranch Diversion/Siphon/Screen	USBR	0.5	1.0	4.5	
Patterson Diversion, Beech Creek	USBR			1.7	
Raymond Diversion, Dixie Creek	USBR			3.8	
Lower South Fork John Day Site 4 Diversion	USBR			2.3	
Lower South Fork John Day Site 6 Diversion	USBR			0.8	
Lower South Fork John Day Site 7 Diversion	USBR			0.2	
Lower South Fork John Day Site 2 Cummings Creek	USBR			122.5	
Lower South Fork John Day Site 3 Cummings Creek	USBR			0.3	
Lower South Fork John Day Site 5 Cummings Creek	USBR			0.7	
Metrics Total for Contracted Projects		**2.5**	**2.0**	**139.8**	**0.0**
Metrics Totals for Anticipated Additional Projects for Completion by 2007		**11.3**	**30.0**	**0.0**	**3.0**
Grand Total		**13.8**	**32.0**	**139.8**	**3.0**

Snake River Spring/Summer Chinook and Snake River Steelhead

Reclamation will implement conservation measures to improve spawning and rearing habitat for Snake River spring/summer Chinook and Snake River steelhead.

Streamflow, Entrainment, and Channel Morphology Projects (Reclamation Conservation Measures)

Near-term priority (2007): In the Little Salmon, Lemhi, and Upper Salmon Rivers subbasins, Reclamation will lease, purchase, and/or conserve 20 cfs of water; and will provide technical assistance to resolve 10 irrigation diversion screen problems; restore 54 miles of tributary access; and, restore 0.25 miles of complexity through 7 known and 12 additional anticipated projects.

Long-term priority (2010): No long-term tributary habitat priorities were identified in the UPA for this ESU. However, the Action Agencies may add priorities using the adaptive management framework if action effectiveness monitoring indicates it would provide needed benefits to the ESU.

Table 13 Habitat Metrics for List of Known Projects and Estimates for Anticipated Projects for Snake River ESUs

Project Name & Number	Agency	CFS to acquire	# of screens	Miles of access	Miles of complexity
L-6 Water Lease	USBR	22.0			
L-3A0 Diversion Replacement	USBR			1.0	
L-9 Diversion Replacement	USBR			1.0	
L-44 Diversion Replacement	USBR			0.1	
Gini Canal Siphon	USBR		1.0		
Squaw Creek Screen Improvement	USBR		1.0		
Sink Creek Flow and Screen Improvements	USBR		1.0	1.2	
Metrics Total for Contracted Projects		**22.0**	**3.0**	**3.3**	**0.0**
Metrics Totals for Anticipated Additional Projects for Completion by 2007		**0.5**	**7.0**	**54.0**	**0.3**
Grand Total		**22.5**	**10.0**	**57.3**	**0.3**

E. Hatchery Actions

Implement a Safety-Net Program as an Interim Measure to Avoid Extinction

Snake River Spring/Summer Chinook

Near-term priority (2007): Continue the artificial propagation safety-net programs for the Tucannon River, Grande Ronde River (Upper Grande Ronde, Catherine Creek, and Lostine River populations), and Salmon River (Lemhi River, East Fork Salmon River, and West Fork Yankee Fork populations), and the Johnson Creek summer Chinook supplementation program.

Long-term priority (2010): Continue to fund the Snake River spring/summer Chinook safety-net programs as long as they continue to be biologically effective and necessary to reduce extinction risk.

BPA funded near-term implementation actions for Snake River spring/summer Chinook safety-net programs are shown in Table 14.

Table 14 Snake River Spring/Summer Chinook Safety-net Programs

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Project No. 200001900, Tucannon River Spring Chinook)	Continue captive brood program for Tucannon River spring Chinook salmon population.

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Project No. 199801001, Grande Ronde Captive Brood O&M	Continue captive brood program for Upper Grande Ronde River, Catherine Creek, and Lostine River spring Chinook salmon populations.
Project No. 199700100, Idaho Chinook Salmon Captive Rearing	Continue captive rearing program for Lemhi River, East Fork Salmon River, and West Fork Yankee Fork River spring Chinook salmon populations.
Project No. 199606700, Manchester Spring Chinook Captive Broodstock	Continue Chinook captive propagation in support of Project No. 199801001 and Project No. 199700100.
Project No. 199604300, Johnson Creek Artificial Propagation	Continue supplementation program for Johnson Creek summer Chinook population.

Mid-Columbia River Steelhead

Near-term priority (2007): Reduce the risk of extinction for Mid-Columbia River (MCR) steelhead by continuing the MCR steelhead safety-net program associated with the Umatilla Hatchery and the Yakima River steelhead kelt reconditioning program.

Long-term priority (2010): Continue implementing these safety-net programs as long as they continue to be biologically effective and necessary to reduce extinction risk.

BPA funded near-term implementation actions for Mid-Columbia steelhead safety-net programs are shown in Table 15.

Table 15 Mid-Columbia River Steelhead Safety-net Programs

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Project No. 198343500, Umatilla Hatchery O&M - Confederated Tribes of the Umatilla Indian Reservation (CTUIR) [MCR steelhead component]	Continue MCR steelhead safety-net program.
Project No. 198903500, Umatilla Hatchery O&M – Oregon Department of Fish and Wildlife (ODFW) [MCR steelhead component]	Continue MCR steelhead safety-net program.
Project No. 200001700, Yakima River Steelhead Reconditioning Program	Continue MCR steelhead safety-net program.

Lower Columbia River Steelhead

Near-term priority (2007): Reduce the risk of extinction for Lower Columbia River (LCR) steelhead by continuing to implement the LCR safety-net program associated with the Hood River Production Program

Long-term priority (2010): Continue implementing this safety-net program as long as it continues to be biologically effective and necessary to reduce extinction risk.

BPA funded near-term implementation actions for Mid-Columbia steelhead safety-net programs are shown in Table 16.

Table 16 Lower Columbia River Steelhead Safety-net Programs

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Project No. 198805307, Hood River Production Program – Confederated Tribes of the Warm Springs Indian Reservation (CTWSIR) [LCR steelhead component]	Continue LCR steelhead safety-net program.
Project No. 198805308, Hood River Production	Continue LCR steelhead safety-net program.

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Program (ODFW) [LCR steelhead component]	

Columbia River Chum

Near-term priority (2007): Reduce the risk of extinction for Columbia River chum salmon by continuing to implement a program to reintroduce chum salmon into Duncan Creek.

Long-term priority (2010): Continue to implement this safety-net program as long as it continues to be biologically effective and necessary to reduce extinction risk

BPA funded near-term implementation actions for the Columbia River chum safety-net programs are shown in Table 17.

Table 17 Columbia River chum safety-net program

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Project No. 200105300, Re-introduction of Columbia River Chum Salmon into Duncan Creek	Continue Columbia River chum salmon safety-net program.

Snake River Sockeye

Near-term priority (2007): Reduce the risk of extinction for Snake River sockeye by continuing to implement the Snake River sockeye salmon safety-net program.

Long-term priority (2010): Continue to implement the Snake River sockeye salmon safety-net program as long as it continues to be biologically effective and necessary to reduce extinction risk.

BPA funded near-term implementation actions to support the Snake River sockeye safety-net programs are shown in Table 18.

Table 18 Snake River sockeye safety-net programs

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Project No. 199107200, Redfish Lake Sockeye Salmon Captive Broodstock Program	Continue the Snake River sockeye safety-net program.
Project No. 199204000, Redfish Lake Sockeye Salmon Captive Broodstock Rearing and Research	Continue the Snake River sockeye safety-net program.
Project No. 199009300, Genetic Analysis of *Oncorhynchus nerka* (modified to include Chinook salmon)	Continue genetic analysis in support of the Snake River safety-net program.
Project No. 199107100, Sockeye Salmon Habitat and Limnological Research	Continue nursery lake habitat enhancement and limnological monitoring and evaluation in support of the Snake River sockeye safety-net program.

Snake River ESUs

Near-term priority (2007): If needed continue to fund the Safety-Net Artificial Propagation Program (SNAPP) planning process identified in the 2000 BiOp. Step 1 of the SNAPP planning process, identification of any additional Snake River populations requiring a safety-net program to reduce risk of extinction, has been completed. The populations identified by SNAPP as being at severe risk of

extinction already have a safety-net program or conservation hatchery program in place to reduce that risk. Therefore, the SNAPP planning process will be suspended. Should the need arise in the future to reinstitute the SNAPP planning process, BPA would participate as appropriate.

BPA funded near-term implementation actions to support the SNAPP planning process are shown in Table 19.

Long-term priority (2010): Should a future decline in the status of listed ESU populations result in a renewed SNAPP planning process, BPA will participate in SNAPP to develop contingency safety-net plans for populations at severe risk of extinction. After review and approval by NOAA Fisheries, the TRT, and other appropriate parties; we would expect implementation of any new safety-net programs to occur through the Integrated Fish and Wildlife Program.

Table 19 Actions Supporting the SNAPP Planning Process

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Project No. 200104900, Safety-Net Artificial Propagation Program (SNAPP) Coordinator	Complete a SNAPP suspension report summarizing work to date and the conclusions of SNAPP Step 1, extinction risk analysis.
Project No. 200200400, Safety-Net Artificial Propagation Program (SNAPP)	SNAPP planning work will be suspended and ongoing SNAPP contracts will end in 2005.

Reduce Potentially Harmful Effects of Artificial Production and Implement Hatchery Actions to Aid Recovery

Multiple ESUs

Near-term priority (2007): Complete Phase III Hatchery and Genetic Management Plan (HGMP) and submit to NOAA Fisheries for review and approval. BPA will continue to fund Project No. 2003-005-00 Hatchery and Genetic Management Plans to complete Phase III HGMPs and submit to NOAA Fisheries for review and approval by 2007.

Snake River Spring/Summer Chinook

Near-term priority (2007): Continue funding the planning process for the Northeast Oregon Hatchery production program.

Long-term priority (2010): Potential implementation of Northeast Oregon Hatchery artificial production actions that NOAA determines to be beneficial to recovery of the ESU.

BPA funded near-term artificial production actions to support the Snake River spring/summer Chinook are shown in **Table 20**.

Table 20 Snake River Spring/Summer Chinook Artificial Production Actions

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Project No.198805301, Northeast Oregon Hatchery Master Plan (Nez Perce Tribe)	Continue planning activities for future implementation of Northeast Oregon Hatchery project
Project No. 198805300, Northeast Oregon Hatchery Planning (ODFW)	Continue planning activities for future implementation of Northeast Oregon Hatchery project

Snake River Fall Chinook

Near-term priority (2007)

- Fund design and construction of modifications of the Lower Granite Dam adult trap and collection facility to provide additional natural-origin fall Chinook broodstock for hatchery operations, increased capability to remove of out-of-basin stray hatchery fall Chinook, and other benefits for the Snake River fall Chinook ESU. BPA and the Corps will work with NOAA Fisheries to determine each agency's appropriate share of the annual operation and maintenance costs for the trapping program, beginning in 2005.
- Continue to fund the Snake River fall Chinook component of the Nez Perce Tribal Hatchery program.

Long-term priority (2010)

- Continue to fund operation and maintenance of the expanded adult trap facilities to maintain the biological benefits to the ESU, assuming the hatchery management actions associated with the benefits continue to be supported the *U.S. v. Oregon* parties and NOAA Fisheries.
- Continue to fund the Snake River fall Chinook supplementation program associated with the Nez Perce Tribal Hatchery as long as NOAA Fisheries considers it beneficial to the ESU.

BPA funded near-term Snake River fall Chinook artificial production actions are shown in Table 21.

Table 21 Snake River Fall Chinook Artificial Production Improvements

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Project No. 200500200, Lower Granite Dam Adult Trap Improvements	Design and construction of improvements to Lower Granite Dam adult salmon/steelhead trapping and holding facilities.
Project No. 198335000, Nez Perce Tribal Hatchery O&M [Snake River fall Chinook component]	Continue the fall Chinook supplementation program in the upper Clearwater River Subbasin.
To be determined – New project under development	BPA and the Corps are working with NOAA Fisheries to determine each agency's appropriate share of the annual operation and maintenance costs for the Lower Granite adult trapping program. In 2005, BPA will initiate a new project through the Integrated Program for its share of those costs in coordination with the NPCC.

Snake River Sockeye

Near-term priority (2007): Take important step in increasing production to jumpstart ESU to support survival and recovery. Improve the facilities at Oxbow Hatchery near Bonneville Dam to produce an additional 150,000 Snake River sockeye salmon smolts annually for release in Idaho in conjunction with the safety-net program. Complete the Oxbow Hatchery facility improvements in time to allow rearing of brood year 2006 sockeye progeny in a smolt program.

Long-term priority (2010): Fund O&M costs for the sockeye smolt program at Oxbow Hatchery as long as NOAA Fisheries considers the program to be beneficial to the ESU.

Table 22 Snake River Sockeye Smolt Production

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
To be determined –New Project under development	BPA is working with NOAA Fisheries and ODFW (the hatchery operator) to develop a project proposal for design, construction, operation, and maintenance of the Oxbow Hatchery smolt facilities. In 2005, BPA will initiate a new project through the Integrated Program in coordination with the Council, which will include ISRP review. BPA will work with NOAA Fisheries to secure approval for the project through *U.S. v. Oregon*.

V. Research, Monitoring and Evaluation

As stated in the UPA, the Action Agencies RM&E program is focused on assessing and maximizing performance of our proposed hydrosystem and non-hydrosystem actions to the achievement of BiOp survival targets for ESA listed salmonids. We will continue to participate in the development, coordination, and implementation of a comprehensive RM&E program that is integrated with the Council's Fish and Wildlife Program, the Corps' Anadromous Fish Evaluation Program (AFEP), Reclamation's appropriated technical assistance activities, and RM&E activities of other Federal Caucus agencies. We will also continue to coordinate the RM&E program with regional Federal, State, and Tribal entities and include available results in the annual progress reports.

A. Hydrosystem RM&E Actions

Hydrosystem Corridor Status Monitoring

Near-term priority (2007): Continue to implement adult and juvenile migration status monitoring within the hydrosystem corridor and improve upon these capabilities to provide dam-specific and system-level passage survival information for ESA-listed species.

Long-term priority (2010): Provide the information needed to determine and track the status of ESA populations and their environment (including assessment of performance measures and standards).

Near- and Long-term Activities include:

- Implement and maintain the Columbia River Basin PIT Tag Information System.
- Conduct annual Smolt Monitoring Program (SMP) at seven mainstem Snake and Columbia river dams.
- Monitor wild Snake River spring/summer Chinook salmon smolt migrations.
- Monitor smolt condition relative to biological and environmental conditions.
- Monitor adult returns with the PIT-tag detection system.
- Provide in-season statistical support, real-time run predictions, and annual review of run-timing predictions.
- Monitor emergence, growth, migration timing, and survival of Snake River fall Chinook.
- Obtain accurate counts of Snake River fall Chinook salmon redds upriver of Lower Granite Dam.
- Produce digital maps of the riparian areas, wetland features, and stream channel boundaries for mainstem streams.
- Complete downstream migrant kelt assessment to determine magnitude of passage, contribution to population diversity and growth, and potential actions to provide safe passage.

Hydrosystem Action Effectiveness Research

Near-term and long-term priorities: Advance the understanding of the effectiveness of flow augmentation, spill, transportation, and system configuration changes on fish survival for each ESU.

Ongoing and new AFEP research projects will continue to support the hydrosystem action effectiveness priorities.

Bonneville Dam
Project survival studies – Second year of testing with new Bonneville corner collector and Bonneville sluiceway. Results from first year of testing suggested positive benefits from the corner collector. The results suggest very high passage for steelhead, good passage for Chinook, and high survival for all stocks through the corner collector.

- 2005: Evaluate all juvenile passage routes.
- 2006: Final report.
- 2006 and 2007: Additional evaluation of spillway passage survival may be necessary as well as model studies to establish powerhouse unit operation priorities. Possible other issues identified through the 2005 project-wide evaluation may require investigation.

Adult fallback analysis – The Corps will complete the analysis of adult fallback and make recommendations on potential improvements for passage.

- 2005: Final report.

Bonneville 2 FGE Improvements

- 2007-2008: The Corps will evaluate the effect of improvements to the screen bypass system at the Bonneville 2nd powerhouse following installation of the modifications of the screen bypass system if needed.

Evaluate the effectiveness of the 1st powerhouse sluiceway – Determine the best survival routes and determine if additional measures for juvenile survival improvements are needed at the 1st powerhouse

- 2005: Data analysis.
- 2006: Final report.

Bonneville Decision Document – The Bonneville Decision Document will be updated using the information from these evaluations and others. The document will assess alternatives for optimizing project survival as needed to meet juvenile and adult performance standards. This assessment will include consideration of juvenile spill operations.

- 2006: Report.

The Dalles Dam
Spillway Survival Improvements

- 2005: Conduct second year of post-construction evaluation of the spillwall. This will include dam and route-specific survival, tailrace egress, passage distribution, effects on TDG, and erosion monitoring. Results from evaluation will be used to determine whether additional spillway improvements are warranted.
- 2005: Test the direct effects of implementing a vortex suppression device in Bay 6 on juvenile salmonid injury and survival.
- 2006: If warranted, permanent vortex suppression devices in spill bays 1 and 6 may be implemented.
- 2006 – 2007: Design and construct additional improvements if warranted.

Evaluate fish passage efficiency

- 2005: Evaluate fish passage efficiency for all routes of juvenile passage.
- 2006: Final report.

Evaluate adult delay and fallback

- 2004: Evaluate adult delay and fallback with new spill patterns developed with respect to the installation of the spillway training wall.
- 2005: Final report.

Evaluate the effectiveness of the new spill patterns

- 2005: Evaluate the effectiveness of the new spill patterns and spillway training wall and determine whether additional improvements to spillway fish survival are warranted.
- 2006: Report.

Evaluate the behavior of fish in the forebay

- 2004 – 2005: Evaluate the behavior of fish in the forebay of The Dalles Dam to determine the feasibility of a physical guidance device for the forebay and assist in design of a device to improve fish passage efficiency.
- 2006: Final report.

John Day Dam

John Day Biological Index Testing – Survival data from 2002-2003 suggest that turbine survival at John Day is much lower than at other FCRPS projects. In addition, survival data from 2000-2003 showed a clear relationship between tailrace egress and fish survival.

- 2005: Design a test strategy to evaluate best turbine operating geometry for fish.
- 2006: Conducted test strategy.
- 2007: Evaluate and report on metrics, including direct effects of turbine passage on fish injury and survival, total survival for fish passing all routes (route-specific and dam), and tailrace egress times and routes.

McNary Dam

Survival/Efficiency Study – Fish survival information at McNary Project is extremely limited. Survival of fish that pass via spillway, turbines, and bypass system is largely unknown. Data will be collected to estimate survival of fish in the lower Snake River and make improvements to the project and/or operations to improve fish survival at this Project. Survival information at McNary is needed to make future decisions regarding spill, operations, and project upgrade. Operations of turbines at McNary turbines may change significantly in the future, which makes collection of good data necessary as both a baseline and to estimate fish survival (and fish condition) under test operations. This information is required to assist in decision-making regarding McNary modernization as well as current project operations. This will include meeting objectives for both the Columbia River Fish Mitigation program (CRFM) and the McNary Modernization program.

- 2005: Fish survival and passage studies using radio telemetry, hydroacousitics, and PIT-tag evaluations. This test may include an evaluation of 24 hour spill vs. 12 hour spill.
- 2006: Continue survival studies.
- 2007: Close-out survival studies.

Ice Harbor

Survival/Efficiency Study

- 2005: RSW Evaluation. This will be the first year evaluation of the RSW at Ice Harbor Dam. Early in the spill season a direct survival test will be conducted to ensure the RSW will not impact run of the river fish. This test will be followed by a more comprehensive test to evaluate the passage distribution and project survival under two spill treatments both during the spring and summer conditions. All juvenile passage routes will be assessed for fish passage efficiency (FPE) and survival in 2005, with a report in 2006. A second year of testing is planned in 2006, with a report in 2007.
- 2006: Continue survival studies.
- Final report.

Lower Monumental
Survival/Efficiency Study – Survival studies at Lower Monumental Dam are needed to assist in future decisions for configuration actions and operations at the project. Future decisions at Lower Monumental include RSW installation, relocation of the bypass outfall, and installation of a training wall between the powerhouse and spillway. Survival studies in 2003 have indicated the possibility of lower than expected survival. Studies in 2004 were designed to lend further detail to the spillway survival and operations. Studies in 2005 will focus on project distribution and survival through all juvenile passage routes to assist in placement of the RSW and provide baseline conditions.

- 2005: Passage and survival studies.
- 2006: Passage and survival studies.
- 2007: Final Report
- 2008: Evaluate the RSW.

Evaluate adult passage, including kelts

- 2007: Evaluate adult passage, including kelts, associated with RSWs as warranted.

Little Goose
Survival/Efficiency Study – Fish survival information at Little Goose is extremely limited. Survival of fish that pass via spillway, turbines, and bypass system is largely unknown. It is imperative to collect this data in order to estimate survival of fish in the lower Snake River and make informed improvements to the Project and/or operations to improve fish survival at this Project. The immediate focus is to obtain information to assist in placement of the RSW and to determine its potential effectiveness to pass juvenile migrants.

- 2005: Begin studies. These actions will require significant baseline/survival information to be attained to assist in making decisions about actions at Little Goose.
- 2005: Survival and passage studies using radio telemetry.
- 2006: Survival and passage studies.
- 2007: Complete study efforts.

Lower Granite
Survival/Efficiency Study – Evaluate the Behavioral Guidance System (BGS) under two treatments to further determine its affects on fish passage. The intent of this year's BGS test is to analyze how a modified BGS changes fish behavior. The assessment will help determine the importance of a guidance device in improving passage efficiency to the RSW and start understanding design parameters of the BGS design (spring Chinook and steelhead).

First year evaluation of subyearling fall Chinook passage through an RSW – Little information is available on how subyearlings will use an RSW. This evaluation will provide information on distribution, collection efficiency, and survival of subyearlings through an RSW at Lower Granite Dam. Anticipate

one year of study. This study will assist in determining levels of spill needed for the longer-term transport vs. in-river study scheduled in the 2008 timeframe.

- 2005: Survival and passage studies of RSW/BGS in spring and RSW in summer.
- 2006: Survival and passage studies if needed in the spring.
- 2007: Complete study efforts.

Flow Deflectors and Divider Wall Evaluations – The Corps will evaluate potential modifications to existing deflectors at Lower Granite Dam. and investigate potential benefits and costs of installation of a powerhouse/spillway divider wall.

- 2007: Develop new operational spill pattern.
- 2008: Prototype evaluations.
- 2009: General model evaluations.
- 2010-2011: Technical report.

Hydrosystem System Studies

Lower Snake River Transportation Evaluations – Tagging for wild steelhead and Chinook for lower Snake River transport evaluations was completed in 2003. An index group comprised only of barged fish was tagged in 2004.

- 2007: Adult returns expected from indexed group of barged fish.
- 2008: Final reporting.

Continued PIT-analysis – An historic PIT analysis of transport studies from 1995-2000 will be continued. This research is meant to give insight into how the transportation process could be improved.

- 2005: Complete an analysis of near shore oceanic and estuarine environmental conditions, the relationship between transport conditions, and hatchery effects. Future updates based on completed adult returns will assist if future actions are warranted.

Mid-Columbia Transport Studies – The Corps will release the fourth and final year of Mid-Columbia River fish for a transport evaluation at McNary Dam in 2005. To date, three years of hatchery Chinook and 2 years of hatchery steelhead (third release in 2005) have been released. Research from this study is expected to provide operational information on the success of bypassing and spilling spring migrating fish and whether re-initiating spring transport at McNary Dam would be appropriate.

- 2005: Final year of released fish.
- 2007: Final year of returned fish (Chinook).
- 2008: Final year of returned fish (steelhead).
- 2009: Final Reporting

Snake River Fall Chinook Transport Studies – New information suggests that a significant percentage of Snake River fall Chinook adult returns migrated as yearlings. This raises questions about the significance of summer operations to the fall Chinook population. As a result, a more comprehensive plan will be developed in 2005 to address the operational needs of Snake River fall Chinook. The plan will include but not be limited to summer transportation evaluations and may lead to a different approach to evaluating transportation. The following is the current status of the transportation study pending the overall plan.

Recent limited information indicates that summer transportation neither helps nor harms Snake River fall Chinook. Future research would help to determine whether transport or in-river passage in the summer is the best management strategy for juvenile Snake River fall Chinook. In addition, this research would directly address whether the Corps should transport or bypass summer migrating fish from both an overall

perspective and a seasonal perspective. Transportation research for Snake River fall Chinook began in 2001. An alternative study design was adopted in 2005 and is expected to be used through at least 2011, depending on the overall fall Chinook research plan and anticipated summer spill program. Adult returns would conclude the overall research by roughly 2015 if the juvenile research concludes in 2011.

An index group of fish trucked from Lower Granite Dam in September and October has been tagged between 2002-2004. Information gathered is expected to provide information on whether to continue trucking fish from the Lower Snake River in the fall. Adult returns are expected through 2008.

Delayed Mortality of Juvenile Salmonids - Studies to determine the causes and effects of differential delayed mortality of transported juvenile fish ("D"). Unexplained post-hydrosystem mortality has been described as the mortality that occurs above the rates observed in the historical data or above the expected rates based on the adult returns documented in similar systems. Speculation on the factors that may cause "extra mortality" have been attributed to unfavorable conditions in the estuary and ocean environments (often referred to as a regime shift), the viability of the stock, and a delayed detrimental effect of the hydrosystem on salmon survival.

- 2005-2006: Sensory system damage, alternative barge release, and barging density.

Fish Ladder Temperature Evaluation - Study to define any problems that may exist specific to effects of fish ladder water temperature on adult salmon and steelhead and to determine feasible methods of mitigating any adverse affects.

- 2006: Phase 2 and 3 reporting.
- 2007-2008: Optional - test prototype structure.

Flood Control Study - The System Flood Control Review investigation of Columbia River flood control operations is intended to determine what changes, if any would benefit endangered species particularly salmonids, while providing acceptable levels of protection from damaging floods and recognizing project purposes.

The System Flood Control Review is currently in a reconnaissance planning phase. The results of this phase will include a report and a project management plan which lays out the recommended approach for a feasibility study.

The feasibility planning phase will likely be structured in two stages. The first stage will focus on Columbia Basin hydrologic modeling to verify current information and to assess a set of scenarios evaluating operations to provide flows that could benefit salmonids passage while providing acceptable levels of protection from damaging floods. An interim report will be prepared to summarize and make recommendations on continuing the feasibility planning phase. If the feasibility phase is continued, the Corps will prepare a combined Feasibility Report and Environmental Impact Statement (FR/EIS).

- 2005: Complete reconnaissance report and project management plan (PMP).
- 2006: Begin feasibility planning phase if funds appropriated.
- 2007: Complete interim report.

PIT-tag recovery – The PIT-tag trawler detection system provides for the monitoring of migration rates, migration behavior, and the standardization of ocean entry times for the comparative survival groups of the multiple survival studies throughout the lower Snake and Columbia rivers. Partitioning losses between the hydro-system, estuary, and oceanic environment is an important element in the understanding of the impacts that system management has on long-term salmon survival. Observations of high avian predation initiated investigations and the development of methodology to recover information from bird colony islands in the estuary. The mortality attributed to avian predation throughout the hydro-system

and estuary has been estimated through the use of PIT-tag detection technology development to recover tags from these islands. The PIT-tag information from avian islands helps to complete the survival databases by filling in the fate of thousands of lost PIT-tags. This information, in conjunction with the estuary PIT-tag recovery efforts help to partition survival throughout the estuarine and near-shore oceanic environment.

- 2005-2007: Evaluate avian predation on passage route, avian monitoring and evaluation within the river system (McNary/Ice), avian monitoring and evaluation, evaluation of survival of PIT-groups – continuous, development of diversion system for delayed mortality, avian island rehabilitation monitoring (estuary and Crescent Island)

Avian Predation Deterrent Program – Study that will focus on gull and other avian predators at each Lower Snake and Columbia River Dam. The study is being initiated in 2005 to evaluate the affects of various deterrent methods on gulls and other avian predators. The results of this study will provide the basis for future deterrent methods at the projects.

2005-2006: Evaluate various avian deterrent methods.
2007: Final report and initiate actions based on results.

Stilling Basin Erosion Study - System study with initial efforts focused on Ice Harbor and Lower Snake River to determine effects on stilling basin under spill operations for fish passage. RSW operations would be included to ensure that operations of specialized passage systems do not increase wear or cause other unanticipated affects on gas generation. Provide any structural/mechanical or operational enhancements that may provide a long term operation with reduced negative effects on fish passage, water quality, and dam safety with potential expansion to other sites as warranted. The objective is to determine to the extent possible if there are adjustments to spill patterns/operations that can provide good and safe juvenile passage while allowing good protection of the stilling basin.

- 2006-2008: Review and research existing data, conduct additional modeling/investigations, and prepare draft report.

Adult passage studies - Complete final summary reports of 1996-2004 radio tagged data (finalized in 2006), including escapement, straying, fallback and passage.

- 2006-2007: Conduct spawning success evaluations using PIT-tagged fish only. Evaluate new adult PIT detection systems using radio tagged fish (2006, maybe additional year). Develop methodology to measure adult performance standards using PIT data. Investigate development of PIT detection in index tributaries to measure straying.

Adult Temperature Evaluation - Water temperature has the potential to affect the migration behavior of adult salmon (rate of passage, delays, wandering/straying, and survival through the hydrosystem); it also impacts the physiological processes that make spawning successful (egg viability and energy expenditure). Thus, the exposure to the longer duration of high temperatures during dam passage and through the tailraces, fishways, and forebays are thought to be a significant contributor to adult salmon passage delays, losses of adults upstream of Lower Granite, and reduced spawning success. Water temperatures encountered by adult salmonids migrating through the lower Snake River are higher and the period of high water temperatures is of longer duration than the temperatures that were encountered prior to construction of upriver storage reservoirs. Optimum migration temperature for Chinook salmon is 14° C. Adult steelhead have been reported delaying at the entrance into the Snake River until river temperatures are less than 21° C. Cold water releases from Dworshak Reservoir in the North Fork of the Clearwater River are the only available option to reduced water temperatures in the lower Snake River. Although the extent to which high water temperatures may compromise the ability of adult salmonids to migrate to spawning grounds and successfully spawn is unknown, fish held in hatcheries at temperatures above 15.6° C have a lowered reproductive potential. Little is known about the existence of cool water

areas in the lower Snake River and their possible use by migrating adult salmonids. Previous telemetry studies have shown that steelhead migrating through the lower Columbia River enter the mouths of cooler tributaries possibly using them as temporary refuges from the higher water temperatures encountered in the mainstem of the Columbia River,

- 2005 - 2006: Analysis and reporting.

Adult Fish Transition Pool and Weir Modifications - Radio telemetry studies underway since 1991 have indicated that approximately 70% of the adult salmon migrating upstream turn around near the transition pool in the adult fishways at the Columbia and Snake River Dams. Of the fish that turn around and move down the fishway, approximately 50% fall out of the fishway back into the tailrace. Adults that have fallen out of the fishway may reenter the fishway immediately or may delay several hours in the tailrace. The average cumulative hydrosystem delay due to fallout of the fishway is approximately 3 to 4 additional days to the migration through the hydrosystem. Transition pools (the junction of the base of the ladder, the collection channel, and a fishway entrance) are consistently shown to be an area of delay within the fishway.

- 2005: Construction if warranted.
- 2006: Biological Test.

Kelt Evaluations – Studies on steelhead kelts have been conducted for several years. The focus of the studies was to enumerate downstream kelt passage and run timing through the Lower Columbia River projects, and to determine passage routes, distribution, and survival. Recent evaluations have concentrated on determining the return rates of kelts with PIT tags for both in-river and transported groups.

- 2005: Final summary report from PIT tagged fish.
- 2006: Develop Action Plan, if warranted, to determine if additional measures or studies are needed.

McNary and Snake River Action Plan - Provide optimized configuration recommendation based on a systematic analysis of the survival benefits of various fish passage operations and technology options at the Lower Snake River and McNary dams to meet the requirements of the BiOp; while at the same time balancing fish needs with other needs of the region. The Action Plan will be developed with the flexibility to incorporate changes and ensure regional coordination. This includes the integration of new information derived from research on surface bypass, transportation, spill, turbine survival, and adult salmon passage into a comprehensive plan for implementation of actions specifically directed to achieve the performance goals of survival and population growth for indicator stocks.

- 2005: Phase one - Preliminary Analysis
- 2006-2007: Detailed Analysis

Adult Lamprey Passage – The Corps will continue to improve on and evaluate auxiliary passage systems for adult lamprey at Bonneville Dam. In particular, the Corps will install a new auxiliary passage system for the Washington shore fish ladder and continue to refine the existing system at the Bradford Island fish ladder. If these systems prove successful, they may be implemented at other Corps dams.

- 2005-2007: The Corps will draft an action plan outlining future research needs and potential dam passage improvements at Corps dams on the Columbia and Snake rivers.

Turbine Survival Program (TSP) – TSP is focused on a couple of measures: a) the development of a long term Biological Index Testing (BIT) plan, and b) support in completing model and survival studies for the Department of Energy.

- 2005: Develop scope and costs for a long-term BIT strategy. Continue investigations on the biological assessment of physical model data and bioresponse of fish passing through turbines.

Develop detailed John Day BIT strategy. Initiate studies to assess pressure acclimation impacts on fish in the context of past, present, and future TSP studies. Continued participation in regional and national forums as they pertain to fish passage.

- 2006: Further assess the impacts of pressure acclimation impacts on fish. Continue development of Long-Term Bio Index Test Plan. Correlate the effect of fish diversion devices on fish distribution at the turbine runner. Perform internal turbine prototype imaging and pressure history to better define the physical environment and fish passage route. Implement BIT strategy to additional families of turbines.
- 2007: Develop plan for modernization of turbine monitoring and control systems to ensure compliance of rigorous biological criteria for operation of turbines. Apply TSP turbine rehabilitation decision framework to existing rehabilitation plan.

Hydrosystem Uncertainties Research

Near-term priority (2007): Address the following hydrosystem related uncertainties:

- In-river juvenile migration survival.
- Relative survival difference of in-river vs. transported fish.
- Effect of ocean entry timing.
- Delayed mortality related to hydrosystem passage.
- Different dam passage histories relative to health and delayed mortality.
- Extra mortality and its causes.

Long-term priority (2010): Improve analytical methods and data sufficient to provide confident assessments of population status and survival for each ESU.

- Evaluate the effect of transportation on adult survival at McNary dam.
- Evaluate the effect of transportation on in-river adult return ratios for wild Snake River yearling Chinook salmon and steelhead from Lower Granite Dam.
- Provide D estimates for Lower Granite Dam transported fish.
- Evaluate the homing of adult fish that were transported as juveniles with the aid of PIT-tagged fish and adult PIT-tag detectors.
- Evaluate barge releases of spring Chinook in the lower Columbia River and estuary.
- Determine measures to correct causes of headburn in adult salmonids.
- Analyze data of radio telemetry monitoring of adult fallback and assess remedial actions.
- Finalize the evaluation of temperature impacts on adult delays, homing, straying and survival.
- Finalize analysis of adult telemetry evaluation of factors that contribute to successful spawning or unaccounted losses and conduct PIT-tag evaluations.

Projects to support hydrosystem corridor status monitoring, hydrosystem action effectiveness research, and hydrosystem uncertainties research are shown in Table 23.

Table 213 Hydrosystem and RM&E Projects

Project Number	Project Title	Agency		Status Monitoring	Action Effectiveness	Uncertainties
1994-069-00	Estimate production potential of fall Chinook salmon in the Hanford Reach of the Columbia River	BPA				X
1991-029-00	The effects of summer flow augmentation on the migratory behavior and survival of juvenile Snake River fall Chinook salmon	BPA			X	
1998-010-04	Monitoring and evaluation of yearling Snake River fall Chinook salmon outplanted upstream of Lower Granite Dam	BPA		X		
1999-003-01	Evaluate spawning of fall Chinook and chum salmon just below the four lowermost Columbia River mainstem dams	BPA		X		
2002-032-00	Investigating passage of ESA-listed juvenile fall Chinook salmon at Lower Granite Dam during winter when the fish bypass system is inoperable	BPA			X	
1999-020-00	Analyze the persistence and spatial dynamics of Snake River Chinook salmon	BPA				
1983-319-00	New marking and monitoring techniques	BPA		X		
2001-003-00	Installation of adult PIT-tag detection systems	BPA		X	X	X
1997-024-00	Avian predation on juvenile salmonids	BPA			X	
2002-027-00	Numerically simulating the hydrodynamic and water quality environment for migrating salmon in the Lower Snake River	BPA		X		
1987-127-00	Smolt monitoring by Federal and non-Federal Agencies	BPA		X		
1989-107-00	Statistical support for salmonid survival studies	BPA		X	X	X
1991-028-00	Monitoring smolt migrations of wild Snake River spring/summer salmon	BPA		X		
1991-051-00	Monitoring and evaluation statistical support	BPA		X	X	X
1997-015-01	Imnaha River smolt monitoring program: Imnaha smolt survival and smolt to adult return rate quantification	BPA		X		

Project Number	Project Title	Agency		Status Monitoring	Action Effectiveness	Uncertainties
1991-073-00	Idaho natural production monitoring and evaluation	BPA				
2000-012-00	Evaluate factors limiting Columbia River Gorge chum salmon populations	BPA				
2003-041-00	Evaluate delayed (extra) mortality associated with passage of Yearling Chinook salmon smolts through Snake River dams	BPA				X

B. Estuary RM&E Actions

Estuary / Plume Status Monitoring

Near-term priority (2007): Provide information needed to determine the status of ESA-listed populations and their environment. Develop estuary habitat pilot status monitoring and participate in regional coordination activities.

Long-term priority (2010): Develop a comprehensive RM&E program for the estuary/ocean that is linked to coordination with other regional agencies' monitoring efforts.

Near- and Long-term Actions include:

- Monitor presence/absence and population identity of juvenile salmonids in the upper reaches of the estuary.
- Evaluate the role of river flow on habitat opportunities and food web structure for juvenile salmon by comparing historic and current conditions using model simulations and empirically derived food-web linkages.
- Evaluate the role of the Columbia River plume in survival of juvenile salmon through long-term observations, fine-scale process studies, retrospective assessments, and modeling to assess management of flow to improve habitat opportunity.
- Habitat monitoring program to develop protocols, procedures, and indicators for measuring habitat condition for both long term habitat monitoring and restoration project monitoring and evaluation requirements; and a toxic contaminant monitoring project to address accumulation of toxic contaminants in sensitive habitat areas, contaminant trends over time, and possible impacts on sensitive species.
- Estimate survival of juvenile salmonids from Bonneville to the mouth of the Columbia River using acoustic tags.
- Determine the relationships between habitat conditions and the life-history diversity, abundance, and performance of juvenile salmon and the potential salmonid responses to past and future habitat change.
- Evaluate the relationship among time of ocean entry, physical, and biological characteristics of the estuary and plume environment and adult return rates.
- Periodically summarize the information from status monitoring, both estuary-wide and reference site monitoring, and action effectiveness research.
- Evaluate the program evaluation and adjust program objectives and methodologies based on new information.
- Document changes to the estuary program through annual progress reports.
- Develop and monitor performance standards as actions are implemented in the adaptive management process concurrent with identifying which factors may be limiting for salmonid viability.
- Describe the present status of the estuary ecosystem in terms of habitat conditions, habitat connectivity, and fauna relative to pre-European settlement conditions (LCREP Habitat Mapping Project and the Bottom, et al., study).
- Monitor the spatial distribution, life history diversity, and growth of juvenile salmon in the estuary.
- Estimate the survival rates of juvenile salmon of listed ESUs through the tidal-freshwater reach (river miles 46-146), the estuarine reach (river miles 0-46), and the plume (continue survival study initiated in 2001).

- Determine the water quality in estuary salmon spawning and rearing habitat relative to state and federal water quality standards and salmon survival needs (LCREP studies).
- Describe trends in the physical condition of estuary salmon spawning and rearing habitat in terms of substrate type, accretion rates, reduction/oxygenation potential, groundwater level, large woody debris, water velocity, and water surface elevation compared to present conditions (LCREP studies).
- Determine the status and trends of abundance, species composition, and distribution of invasive species in the estuary such as purple loosestrife, shad, and New Zealand mud snails.
- Provide biennial summaries of the status and trends of hydrographic and oceanic conditions affecting salmon survival within the estuary and salmon population size.

Estuary Action Effectiveness Monitoring Research

Near-term priority (2007) and Long-term priority (2010): Evaluation of how effectively actions specifically designed to aid listed salmon produce the desired biological and physical response.

- The effects of estuary habitat improvements will be guided by the Action Agencies' *Plan for Research, Monitoring, and Evaluation of Salmon in the Columbia River Estuary.* A new pilot project will be implemented in the lower Columbia below Bonneville to test and coordinate effectiveness monitoring activities in the estuary.
- Develop an understanding and quantification of the effect of habitat improvement actions on juvenile salmon in the Columbia River estuary.
- The effects of estuary habitat improvements will be addressed on both a landscape and project scale through implementation of the Thom, et al, study, *Evaluating Cumulative Ecosystem Response to Restoration Projects in the Columbia River Estuary*.
- Determine if individual restoration projects in the Columbia River estuary (no habitat projects in plume), as implemented, meet the project-specific performance goals.
- Determine if the projects collectively meet program goals.
- Determine whether individual restoration projects in the Columbia River estuary are effectively changing relevant structural or functional parameters relative to reference and/or control sites.
- Determine the extent habitat restoration projects in the Columbia River estuary, collectively, are affecting targeted ecosystem processes that support listed salmon. Determine the cumulative effect of habitat restoration on juvenile salmon survival in the Columbia River estuary.

Estuary Uncertainties Research

Near-term priority (2007): Address the relationships of estuary habitat to salmon production and survival and the effects of FCRPS operations on estuary and plume habitat condition.

Long-term priority (2010): Improve analytical capabilities and data sufficient to provide confident assessments of population status and juvenile survival in the estuary/plume environments.

- Determine the significance of the lower river and estuary, including the plume, to listed salmonid ESUs.
- Determine the highest priority habitat types for restoration in the lower Columbia River and estuary.
- Identify changes that could be made to FCRPS operations that would improve habitat conditions in the CRE&P.
- Determine the benefits of tide gate replacement as a means to reconnect habitats to tidal influence, how it pertains to reconnectivity of shallow water habitats, and benefits to ESA listed salmonids.

The Action Agencies will continue to fund the estuary studies shown in Table 24 during the 2005-2007 timeframe:

Table 224 Estuary Habitat RM&E Projects

Project No.	Project Title	Type (SM/AE/U)
	McComas et al. 2001-2008, *A study to estimate salmonid survival through the Columbia River estuary using acoustic tag* (Corps).	SM/AE/U
	Bottom et al. 2001-2007, *Estuarine habitat and juvenile salmon – current and historic linkages in the lower Columbia River and estuary* (Corps).	U/SM
2003-010-00	Bottom et al. 2003, *Historic Habitat Food Web Link*, Historic habitat opportunities and food web linkages of juvenile salmon in the Columbia River Estuary: implications for managing flows and restoration.	AE/U
200311400	Welch et al. 1998-2003, Canada Department of Fisheries and Ocean, *Ocean survival of juvenile salmonids in the Columbia River plume.*	SM/U
	Thom et al. 2003-2009 *Evaluating the Cumulative Ecosystem response to Restoration Projects in the Columbia River Estuary* (COE).	U/AE
199801400	Casillas et al. 1998-2003, *Survival and growth of juvenile salmonids in the Columbia River plume*.	SM/U
200300700	LCREP, Lower *Columbia River/Estuary Ecosystem Monitoring*.	SM
200300600	Sea Resources Inc., *Effectiveness Monitoring Chinook River Estuary Restoration*.	AE
200500100	BPA, *Estuary RME Pilot Project*	SM/AE
200300900	Canada Department of Fisheries & Oceans, *Canada-USA Shelf Salmon Survival Study*.	SM
	Muir et al. 2001-2008, *Evaluation of the relationship among time of ocean entry, physical, and biological characteristics of the estuary and plume* (COE).	U/AE
2003-010-00	*Historic Habitat Food Web Link*, continue to provide support to both the conceptual and numeric estuary models that will contribute to understanding the physical processes that control or contribute to potential limiting factors for juvenile salmonids. Continue to fund refinements to the numeric models covering circulation and water properties predictions and sediment dynamics.	
2003-010-00 and 1998-014-00	*Historic Habitat Food Web Link*, continue to fund refinement of the CORIE/ELCIRC model under the RM&E studies, specifically the Bottom et al. work.	
2003-010-00	*Quantify the amount of shallow water habitat restored with the actions identified in the UPA to ensure that the total acres of shallow water habitat contained within these projects are within the range of the effect of summer discharge in the Lower Columbia River*.	
2002-077-00	Estuary/Ocean RME support and Facilitation	AE/SM/U

C. Tributary RM&E Actions

Tributary Status Monitoring

Near-term and long-term priorities: Continue to implement tributary habitat pilot status-monitoring projects, participate in regional coordination activities, and implement policies that support a comprehensive and compatible network of regional programs. Assess the limiting factors of the UPA's

tributary program subbasins on a periodic basis to ensure that the tributary actions are addressing the correct factors.

In the UPA, the Action Agencies committed to:

- Implement status monitoring pilot projects within the Upper Columbia tributary subbasins to further advance the methods and information needed for assessing the status of fish populations and their environment.
- Monitor John Day subbasin adult steelhead spawning and juvenile migration timing, abundance, and rearing densities.
- Expand the Columbia River Basin PIT Tag Information System to systematically plan PIT-tag efforts in the pilot study basins that production and survival can be estimated throughout the system for wild and hatchery fish.

Tributary Habitat Action Effectiveness Research

Near-term priority (2007): Implement action effectiveness research through pilot studies in key subbasins.

Long-term priority (2010): Identify the general magnitude and relative effectiveness of different categories of tributary habitat actions and their combined contribution toward meeting any gap deficiencies. Develop and implement an effectiveness-monitoring program to confirm the benefits of tributary habitat actions.

In the UPA, the Action Agencies committed to:

- Implement a tributary habitat effectiveness project in the Upper Columbia.
- Coordinate tributary action effectiveness efforts with other Federal Caucus agencies, the states and the tribes through the Upper Columbia Basin Monitoring Strategy and PNAMP.
- Monitor intensively monitored restoration activity watersheds and controls and annually record all metrics. Analyze metrics and report physical and biological responses at 3 and 5 years after the BiOp is signed.
- By the end of Year 2 (Dec 2006), all levels of monitoring will be in place (project tracking Year 1, reach-scale monitoring, Year 2, population productivity effects, Year 2)
- In Year 3, and each year thereafter, integrate all levels of monitoring to assess if anticipated improvements are being achieved.

Table 25 lists the tributary RM&E projects that are being implemented by the Action Agencies in the 2005-2007 timeframe to implement their UPA commitments.

Table 235 Tributary habitat RM&E projects

Project Number	Project Title	Agency		Tributary Status Monitoring	Habitat Action Effectiveness	Uncertainties
2003-017-00	Develop and Implement an Integrated Status and Effectiveness Monitoring Program for Salmonids and their Habitat in Three Pilot Subbasins	BPA				
1994-050-00	Salmon River habitat enhancement M & E	BPA		X		
1998-016-00	Salmonid productivity, escapement, trend, and habitat monitoring in the Oregon portion of the Columbia Plateau Province	BPA		X		
2002-033-00	John Day salmonid recovery monitoring program	BPA		X	X	
	John Day Basin pushup dam research	USBR		X		
	Indexing carrying capacity of salmonids on the basis of stream temperature - John Day Basin	USBR			X	
	John Day Basin Water Management Geographic Information Systems (GIS) Database	USBR			X	
	Lower Methow tributaries effectiveness monitoring study	USBR			X	
	RME Data Management Plan John Day Basin Pilot: detailed needs assessment for subbasin research and evaluation	USBR			X	
	Methow Basin monitoring coordination Contract	USBR			X	
	Application of advanced remote sensing in the Columbia River Basin	USBR		X		
	Database validation for stream restoration projects in the Columbia River Basin	USBR			X	
	John Day Basin Hydrography GIS data editing-BLM	USBR		X		

Project Number	Project Title	Agency		Tributary Status Monitoring	Habitat Action Effectiveness	Uncertainties
	Lower Methow tributaries intensive effectiveness monitoring study	USBR		X		X
	Lower Methow Trib PIT Tag interrogation unit study	USBR			X	
	Methow River basin hatchery review	USBR			X	

D. Hatchery RM&E Actions

Hatchery Status Monitoring

Near-term priority (2007): BPA funded the drafting of a comprehensive hatchery-marking plan that could be used to inform NOAA Fisheries marking guidelines. Once NOAA Fisheries provides the marking guidelines, the Action Agencies will then consider how to proceed with marking of hatchery released fish. Any subsequent implementation details would be included in future implementation plans.

Hatchery Action Effectiveness Research

Near-term priority (2007): BPA will continue to fund RM&E to determine whether safety-net hatchery programs and other UPA hatchery actions contribute to recovery of targeted populations of salmon and steelhead. The BPA-funded projects in the table below are those that have a major project component that directly contributes to monitoring and evaluation of the effectiveness of the safety-net programs and other hatchery actions included in the UPA and in this *Draft IP*. In some cases, monitoring and evaluation has been incorporated into the safety-net projects previously listed instead of being accomplished through an additional project. There are other RM&E projects that may provide useful hatchery monitoring and evaluation information, e.g., smolt outmigration monitoring data, and/or help resolving scientific uncertainties related to artificial propagation. These projects were not listed in the table.

Long-term priority (2010): Determine whether safety-net hatchery programs contribute to recovery of targeted populations of salmon and steelhead.

Table 246 Hatchery Action Effectiveness projects

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Project No. 199000500, Umatilla Hatchery M&E	Continue M&E related to MCR steelhead safety-net program.
Project No. 199000501, Umatilla Basin Natural Production M&E	Continue M&E related to MCR steelhead safety-net program.
Project No. 198805304, Hood River Production Program M&E	Continue M&E related to LCR steelhead safety-net program.
Project No. 198805303, Hood River Production Program M&E	Continue M&E related to LCR steelhead safety-net program.
Project No. 199800702, Grande Ronde Supplementation Lostine River O&M/M&E	Continue M&E related to Grande Ronde Chinook (Snake River Spring/Summer Chinook) safety-net program.
Project No. 199800703, Grande Ronde Supplementation O&M/M&E	Continue M&E related to Grande Ronde Chinook (Snake River Spring/Summer Chinook) safety-net program.
Project No. 199801006, Captive Broodstock Artificial Propagation	Continue M&E related to Grande Ronde Chinook (Snake River Spring/Summer Chinook) safety-net program.
Project No. 198335003, Nez Perce Tribal Hatchery M&E	Continue M&E related to Snake River fall Chinook supplementation in the Clearwater Basin

E. Predator Control RM&E Actions

Predator Control Action Effectiveness Research

Near-term priority (2007) and Long-term priority (2010): Estimate the juvenile salmonid survival benefits associated with an increased incentive program

Northern Pikeminnow: BPA will continue to model the additional removal of northern pikeminnow the same way that we have evaluated and estimated the cumulative benefits of the NPMP to date. As noted in Section IV.B. of this document, the NPMP (Project No. 1990-077-00) will continue to model estimates of the effect on juvenile mortality from increased exploitation of northern pikeminnow.

Caspian tern redistribution: Action effectiveness monitoring and evaluation would be developed as part of the response to the proposed management action. See Section IV.B. of this document for implementation details of the Caspian tern program.

Other fish predation, Mid-Columbia River Caspian tern management, and Cormorant management: Action effectiveness monitoring would be a program component of any predator control programs developed and adopted in the future. See Section IV.B. of this document for implementation details for Mid-Columbia River Caspian terns, cormorants and other fish predators.

Table 27 Predator Control Action Effectiveness projects

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Project No.1990-077-00, Northern Pikeminnow Management Program (BPA)	Continue and improve ongoing M&E program component of Northern Pikeminnow Management Program. Evaluate effectiveness of any other non-indigenous predator management program if tested and implemented.
Project No. 1997-024-00, Avian Predation on Juvenile Salmonids in the Lower Columbia River (BPA)	Continue the RM&E program to determine the effects of tern redistribution on colony size, annual level of reproductive success, and annual consumption levels of juvenile salmonids by Caspian terns remaining on East Sand Island. Validate the assumption that there is a linear relationship between the number of terns nesting on East Sand Island and the number of juveniles salmonids consumed. Continue and expand research efforts to determine whether or not other avian predators nesting on East Sand Island are compensating for the decrease in juvenile salmonid consumption by the redistribution of Caspian terns.

F. Harvest RM&E Actions

Near-term priority (2007) and Long-term priority (2010): Implement fish harvesting incidental mortality monitoring focused on Columbia Basin fisheries.

G. *Project Implementation Monitoring*

Near-term priority (2007): Adopt standardized reporting protocols consistent with Pacific Coastal Salmon Recovery Fund (PCSRF) reporting metrics with GIS spatial coordinates for habitat projects.

Conduct compliance evaluations of at least 25 percent of habitat improvement projects. Develop and maintain a database system for project tracking and progress reporting.

Long-term priority (2010): Project implementation monitoring is a standard procedure within implementing agencies.

Standardization of reporting metrics is being implemented through ongoing coordination within the PNAMP and through the requirements of AA contracts. Compliance evaluations will be primarily accomplished through the project oversight of contract managers. Additional support may be pursued through contractor support.

H. *Data Management System*

Near-term priority (2007): Provide data management support for RM&E program information. Implement data management pilot projects in the Upper Columbia (Wenatchee, and possibly the Entiat, and Methow), the John Day subbasin, and a third pilot area within a high priority habitat action area, and the lower Columbia estuary.

Long-term priority (2010): Establish a coordinated information system network to support the RM&E program and related performance assessments.

- Provide data management support for biological and programmatic level performance tracking.
- Develop GIS based data management tools and prototype database system for habitat condition and tributary fish monitoring data.
- Participate and support the Northwest Data Network (NED) project.

Table 258 Data Management Actions

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Project No. 2003-017-00, Integrated Status and Effectiveness Monitoring Program	Develop standardized monitoring protocol tool, spatial (GIS) database, and tabular database (with GIS links). Coordinate across all pilot study areas.
Project No. 1989-062-01, Annual Work Plan – Subcontract for NED Phase II	Coordinate the NED process and achievement of NED products and objectives
Project No. 1996-019-00, Second-Tier Database Support	Hydro system survival and fish passage information

I. *Regional Coordination*

Near-term priority (2007): Integrate the regional, multi-agency network of status monitoring programs with action effectiveness and critical uncertainty research strategies. Coordinate status monitoring and tributary habitat action effectiveness RM&E primarily through the PNAMP.

Long-term priority (2010): Develop an integrative conceptual model to help link the various monitoring and research efforts and further define the regional monitoring network. Develop a robust and comprehensive RM&E program that is linked to and coordinated with other agencies, such as the EPA and state regulatory agencies, as well as NOAA Fisheries. Develop and implement RM&E projects in coordination with other Federal, State, and Tribal programs.

Coordinate RM&E activities through participation and support of coordinating forums such as the Federal Caucus RM&E work groups, Tributary Status and Effectiveness Pilot Project work groups, PNAMP, Upper Columbia Regional Technical Team, and AFEP.

Table 29 Regional Coordination

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Project No. 2004-002-00, PNAMP Funding	Coordinate PNAMP workgroups and products.
Project No. 2003-017-00, Integrated Status and Effectiveness Monitoring Program	Coordinate monitoring approaches and protocols with other regional entities across all pilot study areas.

VI. Other Reclamation Actions

The following actions are associated with the operation of 19 Reclamation projects described in Appendix B of the UPA:

- Continued investigation of the use of the Columbia Basin Project wasteways (primarily Red Rock Coulee and Crab Creek) by listed salmon and steelhead. A final field observation was completed in 2004 and a final report will follow in 2005.
- Continued water quality monitoring of surface return flows, from the Columbia Basin Project. Monitoring will continue through 2006 and a report will be completed in 2007.
- Continued consultation on Reclamation's tributary projects. The ten tributary projects within the range of listed salmon and steelhead include: (1) Yakima, (2) Umatilla, (3) Deschutes, (4) Crooked River (5) Wapinitia, (6) Lewiston Orchards, (7) Tualatin, (8) Okanogan, (9) Chief Joseph (not to be confused with Chief Joseph Dam), and (10) The Dalles (not to be confused with The Dalles Dam).

VII. Additional Actions from the NOAA BiOp

A. Conservation Recommendations

BPA will cooperate with the necessary parties to evaluate the conservation recommendations regarding additional Snake River sockeye and subbasin planning infrastructure, and provide support for any resulting measures recommended through the BPA/Council project review process, subject to available funding within BPA's Integrated Fish and Wildlife Program.

Subbasin Planning Infrastructure

NOAA Fisheries recommended that the Action Agencies continue to facilitate the existing subbasin planning infrastructure "to ensure that subbasin plans are implemented effectively and efficiently and are updated and modified at three-year intervals using the best available scientific information." (see 2004 BiOp p.9-1). The Council is responsible for directing the subbasin planning process, which is a part of the Council's 2000 Fish and Wildlife Program. BPA provided over $15 million to fund subbasin plan development. The Council has begun to amend subbasin plans into the Council's fish and wildlife program. Whether the subbasin plan infrastructure is to continue, and whether the plans will be updated and modified at three-year intervals, is part of a broader regional discussion the Council has initiated to address implementation of the subbasin plans. BPA is participating in that discussion and will continue to do so. Subbasin planning infrastructure may also be considered part of the broader effort to address regional recovery planning that is not exclusively related to FCRPS mitigation. As a result, at this point, it is not certain whether or at what level BPA support for this conservation recommendation will be

requested, but BPA will continue to cooperate with the Council as it integrates subbasin plans into the Fish and Wildlife Program.

Snake River Sockeye Salmon

NOAA Fisheries recommends that the Action Agencies develop a second artificial propagation facility (in addition to the Oxbow Hatchery smolt program) designed to produce up to 150,000 smolts and suggests that the Action Agencies assess the feasibility of developing the Sawtooth Hatchery as the second facility. At this point, the concept is in an early stage of development by NOAA Fisheries, and is too uncertain for BPA to determine whether it will be able to support such a proposal. The Sawtooth Hatchery is a Lower Snake River Compensation Plan facility operated by Idaho Department of Fish and Game (IDFG). As a result, this discretionary conservation recommendation should be considered by the Stanley Basin Sockeye Technical Oversight Committee (SBSTOC), a technical forum for implementation of the Snake River sockeye safety-net program, with representation from IDFG, Shoshone-Bannock Tribes, NOAA Fisheries, BPA, and other agencies. Any option for additional smolt production will need the approval of the parties in *U.S. v. Oregon,* and would need to proceed through established fish and wildlife funding processes.

B. Incidental Take

Reasonable and Prudent Measures

The 2004 BiOp requires that the Action Agencies monitor the level of take associated with the UPA and report the results to NOAA Fisheries in a timely manner. It also requires the Action Agencies to minimize the level of take by implementing specific Terms and Conditions. The Action Agencies have included actions to implement these Terms and Conditions in this *Draft IP* as follows:

Monitoring Take Due to Mainstem Hydro Operations

Evaluate Reach Survival: See RM&E sections on Hydrosystem Status Monitoring and Hydrosystem Uncertainties.
Monitor Smolt-to-Adult Returns: See RM&E sections on Hydrosystem Status Monitoring and Hydrosystem Uncertainties.
Monitor Delayed Mortality: See RM&E section for Hydrosystem Uncertainties.

Monitor Effects of Dissolved Gas Supersaturation: See RM&E section on Hydrosystem Status Monitoring.

Monitor Adult Survival and Kelt Passage: The Action Agencies continue to count and report adult counts at the Lower Snake and Columbia River projects. In addition, the Action Agencies have funded efforts to determine the survival of adult salmonids with the use of radio tracking techniques. Starting in 2005, with the addition of PIT-tag monitors located in the adult ladder systems, adult survival rates will be calculated. The efforts cited above will allow for annual assessments of adult abundance, adult trends, and survival through the hydrosystem. Additional information on adult studies can be found in the Hydro Status Monitoring section.

Report Progress in Implementing Fish Passage Plan in a Timely Manner: The Fish Passage Operations and Maintenance Team (FPOM) develop operational priorities and operating criteria that are summarized in the Fish Passage Plan (FPP). This plan is updated annually and implemented by project

personnel and others involved with river operations. It can be referenced at http://www.nwd-wc.usace.army.mil/tmt/documents/fpp/fpp2002.pdf. The Corps provides weekly written inspection reports describing out-of-criteria situations, adjustments made to resolve problems, and a detailed account of how out-of-criteria situations affected project fish passage and survival. The weekly inspection reports also include summaries of equipment calibrations, adult fish collection channel velocity monitoring, and water temperature monitoring. The Corps also provides in the annual report, information that summarizes project operations and maintenance, fish passage facility inspections and monitoring, severity of out-of-criteria conditions, and avian predation abatement actions.

Monitoring Take Due to Beneficial Effects of Non-Hydro Actions

Monitoring Impacts of the Fish Predation Reduction Program: The Action Agencies will continue to evaluate and report changes in northern pikeminnow predation rates on juvenile salmonids including impacts associated with continuing the increased incentive program and site-specific fishery implementation. This information will be included in the Action Agency annual reports.

Improving Juvenile and Adult Passage Survival

Additional Measures to Minimize Incidental Take

Refine the SYSTDG gas model and its use as a river operations management tool: The SYSTDG is currently being utilized for management of spill at mainstem FCRPS projects. We are continuing to refine the model as new operational information becomes available. For additional information, please refer to the WQP.

Refine a water quality model that addresses Columbia and Snake rivers mainstem temperature monitoring and meteorological data: The Action Agencies are moving forward with refinements to a water quality model. The Water Quality Team recommended use of the CE-QUAL-W2 model, which is being refined in phases. The first phase was initiated and anticipated to be complete in 2005. Phase 2 and 3 are scheduled to be completed in the next few years. Each phase is being refined based on a geographical area. Additional information can be found in the WQP.

Evaluate juvenile projects-specific passage survival both before and after configuration and/or operational modifications: The Action Agencies have provided an extensive RM&E program related to dam specific survival studies. Please refer to the Hydrosystem Action Effectiveness Research section. The intent of these studies is to first develop the baseline information on the potential configuration or operational change and then evaluate the effects of the modification. These studies are part of the Corps Anadromous Fish Evaluation Program. These studies are prioritized annually through the Regional Forum Process.

Continue to assess and enumerate pre-spawning mortality and reduced spawning success of adult upstream migrating fish: Efforts are continuing to enumerate pre-spawning mortality and spawning success. The ongoing evaluation is being conducted on the South Fork of the Salmon River. The South Fork Salmon was chosen as a representative site due to its long migration route and well established monitoring system. These studies were identified in the hydro action effectiveness system studies section.